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VOLUME 5, No. 1 JANUARY 1953

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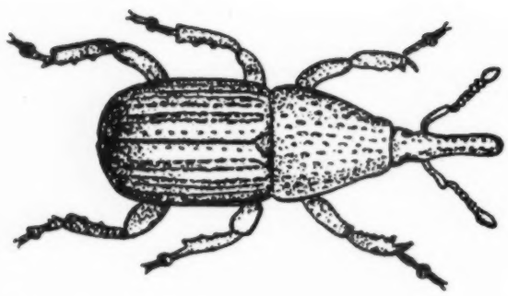

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WORLD CROPS

Editor: Sir Harold A. Tempany, C.M.G., C.B.E., D.SC., F.R.I.C.

Vol. 5. No. 1. JANUARY 1953

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Cultivation of Pineapples in Queensland

Our cover picture was taken on a mixed farm near Brisbane, Queensland, Australia, and shows cultivation of pineapples by a series III Rotavator 'Gem'. The job in hand is weed control and the cultivating rotor is therefore set quite shallow. Another crop for which the Rotavator is used on this particular farm is bananas.

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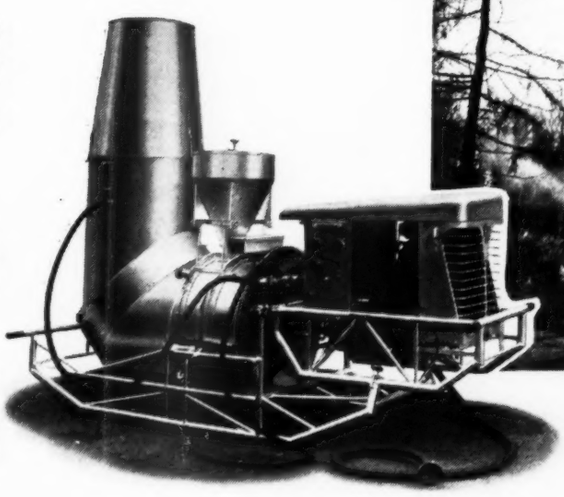

The above illustrations show DUSTEJECTOR MINOR throwing powders to great height, and the new MISTEJECTOR.

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Editorial Comment

A Happy New Year

IN commencing the fifth volume of WORLD CROPS we once more take the opportunity of offering our rapidly widening circle of readers the time-honoured salutation, 'A Happy New Year.' In so doing we cannot be blind to the fact that the world situation in regard to food and agriculture continues, unhappily, to present many of the distressing features which have characterised it for some years past. We go on hoping that the proverbial lining to the clouds may reveal itself in the near future and that world prosperity and peace may be in very truth ' round the corner,' but in common honesty we cannot afford to deny that the prospect remains one which not even the most optimistic among us can afford to regard as other than disquieting.

It is true that so far we have succeeded in avoiding a major world conflict; it is also true that, as is shown in the review of the world food situation during 1951-52 which we present on another page, mondial agricultural production shows some increase over the preceding year, although on the whole there is little sign that it is increasing in step with the needs of growing world populations or making any real progress towards raising the living standards or satisfying the food requirements of the undernourished millions.

There are, it is true, signs that the real needs of the people of the world and the implications of these needs are becoming increasingly appreciated and understood, but unhappily how very far are we still from effective action to improve matters.

In saying this we would not wish in any way to underrate the efforts of the Food and Agriculture Organisation of the United Nations, which is certainly accomplishing wonders with the limited resources it can command, notably in making available technical advice and resources to many of the more backward nations of the world, to enable them the better to cope with the enormous problems with which they are confronted.

Let us hope that the next twelve months will see some lightening of the horizon and that they may be accompanied by an easing of the intolerable burden of rearmament which is such a heavy handicap to agricultural endeavour.

For our part it will continue to be our aim to bring timely news to those concerned of developments in the world agricultural situation, a task which we have been given to understand from many quarters we have discharged in the past with some success, thereby contributing in some small measure to the end which all must desire. To all our readers in many lands we accordingly wish a brighter and happier period in 1953, coupled with the hope that it may witness a substantial strengthening of the factors making for world peace, and some lessening of the present international tensions which are so grievous a bar to human happiness and well-being.

Rubber to Rio

FROM a paragraph in a recent issue of our contemporary, *Petroleum*, we learn that plans for the erection of a factory for the manufacture of synthetic rubber in Brazil, possibly in the Sao Paulo area, have recently been presented to the Brazilian congress. It is suggested that this project, if it materialises, may enable Brazil to become independent of rubber imports from Malaya, which are at present reported to amount to some 30% of the total consumption of rubber in Brazil.

At first sight this certainly seems to present some analogies with the ancient and proverbial process of bringing coals to Newcastle, bearing in mind that Brazil itself is the natural home of the Para rubber tree, *Hevea brasiliensis*, from which 99% and more of the total supplies of natural rubber in the world are derived. The introduction of the Para rubber tree to the Far East through the agency of the Royal Gardens, Kew, acting through the intrepid Mr. (later Sir) Henry Wickham, is one of the most romantic episodes in the history of agriculture in the tropics and this latest development seems to be in the nature of time's revenge for the failure to prevent the export of planting material of Hevea from Brazil, which was attempted, wisely or otherwise, by the Brazilian Government at the time of Wickham's exploit.

It is often a matter of wonder to many why with apparently everything in favour of local expansion, the growth of the plantation rubber industry occurred in the Far East and not in the natural home of the rubber tree in Brazil, whence in the early days and prior to the inception of the plantation rubber industry, the principal world supplies of rubber were derived from trees growing wild in the forests of the Amazon.

The answer is not entirely simple. In the first place it must be attributed to the absence of sufficient labour supplies in Brazil to undertake developments on the scale required, combined with insufficient confidence in the stability of conditions in Brazil at that time which failed to attract the necessary capital for development, while conditions in the Far East with abundant available labour and the then prevailing political stability provided almost ideal conditions for expansion. In the second place the development of a disease of the foliage—*Hevea dothidiella*—which greatly handicaps, if indeed it does not entirely exclude, the possibility of extensive cultivation, is another important limiting factor wherever plantation development has been attempted in South America, *e.g.* the extensive efforts made by the Ford Company. At present, with help and assistance from U.S.A. scientific authorities, efforts are being made to isolate strains of Hevea resistant to this disease, with some success. It would seem, however, that the new project may indicate that the Brazilian authorities attach greater reliance to the ability of the chemist to produce acceptable synthetic rubber substitutes than to those of the biologist to evolve disease-resistant strains of Hevea.

Gold Coast cocoa

IT is satisfactory to be able to record that recent despatches from the Gold Coast indicate that there has been a perceptible improvement in the attitude of farmers in both the eastern and western regions of the Gold Coast Colony towards the disease control measures which are considered essential if the cocoa industry is to be preserved from destruction by the complex of diseases known as Swollen Shoot. In Ashanti and the Trans-Volta region, however, there has so far been little change from the non-cooperative attitude on the part of farmers, upon which we commented some time ago.

It appears that, alarmed at the continued spread of the disease and lack of cooperation by growers in taking control measures, the Prime Minister and Minister for Agriculture and Natural Resources has recently issued a statement expressing concern at the position, authorising in detail the procedure which the department is expected to follow in its efforts to safeguard the industry and ensuring that the wish of the great majority of Gold Coast cocoa growers to save the industry by cutting out diseased trees should not be frustrated by the actions of a non-cooperative minority.

A very large number of copies of the Prime Minister's statement have, we gather, been printed and distributed widely throughout the cocoa-growing areas, and indeed throughout the Gold Coast. It is confidently expected that the effect of the action will be to widen the understanding of the necessity for the restrictive measures and that in the long run the result will be that the number of non-cooperative farmers will be reduced to negligible proportions.

Let us hope that these expectations will materialise.

Tea problems

FOR the first time since the end of the war supplies of tea were in 1951-52 larger than the demand in importing countries. Production increased in all the main exporting countries with the exception of Japan, while in India a slightly lower harvest in Northern India was more than offset by a very large crop in Southern India. Ceylon, which in the previous year had again harvested a record crop despite the ravages of blister blight, recorded a 3% increase in yield, while in Pakistan production reached a record figure, and in Indonesia production recovered to 62% of pre-war.

As a result of this the British Ministry of Food, despite its tradition of conservatism, decided to abolish rationing of tea which would in the circumstances have been hard to continue to justify, while tea prices have dropped considerably, having fallen from an average of 43.7d. per lb. during 1951 to 35.5d. in the earlier months of 1952—a drop of 19%, and still sustained.

Such a situation is bound to have repercussions in all tea-producing countries; in Northern India, which accounts for five-sixths of the country's output and where the authorities forecast a record tea crop for the coming season, the outlook is judged to be especially gloomy. Speaking at a recent meeting of the Calcutta Tea Merchants' Association, Mr. M. E. Sinha, its president, is reported to have stated that at present yield is not the major consideration since overseas buyers are now seeking quality. He urged that in India tea growers should make every effort to raise the standard of production and to ensure that the so-called second grade teas are not offered for sale.

No doubt during the war when tea was in short supply the tendency in most producing countries was to favour coarse plucking in order to raise the output in view of high prices and short supplies. Today when the shortage no longer exists the tendency must be for more conservative methods with a view to raising the quality at the expense of the yield.

What, however, alarms producers at all points is that the severe price fall has come at a time when production costs are still rising. In North India, for example, since 1946 they have increased by 213.5% and are still increasing.

The necessary adjustments to achieve stable equilibrium seem likely to prove difficult and painful.

Land tenure reform and FAO

AMONG the many problems which must be solved if the aspirations of the world to increase available food supplies and general agricultural production can be realised, is that of the terms and conditions under which land is occupied and utilised.

There can be no doubt that measures of land reform could help and complement many kinds of technical aid at present being attempted by the agencies of UNO and FAO, through the Expanded Technical Assistance Programme.

Under the terms by which they operate the participating organisations of UNO can, however, only move in such matters in response to requests from member governments; so far only one government has proffered a request for help in undertaking measures of land reform, *viz.* a request to FAO from Brazil.

On the other hand, all the organisations which operate under the aegis of UNO have expressed their interest in this matter. Thus ILO, the International Labour Organisation, has placed on record its feeling that high priority should be given to land reform questions, and has expressed its willingness to collaborate with other agencies in solving the problems involved. FAO itself at its sixth session in 1951 discussed the question at length, formulating a resolution and providing funds which enabled its Director to expand his programme considerably in this regard. The work proposed includes a series of preliminary studies which will include functional monographs on the characteristics of the main types of land tenure and the problems to which they give rise; also a bibliography of the subject and a few general studies on method. Work on these lines is stated to be well advanced, while FAO is collaborating with UNO in the preparation of a questionnaire on land reform.

UNESCO considers that it can help by promoting the development of education in rural areas and by undertaking sociological, legal and administrative research into procedures of land reform and their effects on rural com-

munities. They envisage the inauguration of a series of regional conferences and seminars, as well as training centres and courses to give specialised training in matters relating to land reform.

It is satisfactory to see the action that is being taken by the various agencies in this important connection, and it is the hope of all that eventually it may pave the way for effective action by governments which will enable badly needed reforms to be brought about.

British agricultural production

TWO articles which have recently appeared in the London *Times*, reviewing the position of British agriculture, provide a succinct account of the present condition of affairs in this connection and permit certain conclusions and reflections regarding the future outlook.

In 1939 the British farmer had been, so to say, crippled by years of inaction; the remarkable performances of British agriculture during the first world war had been largely forgotten and the promises held out at its conclusion remained unfulfilled. Millions of acres lay semi-derelict and some farmers had almost forgotten how to till. The position was, if anything, worse than before 1914, and despite some rather half-hearted attempts to organise the marketing of farm crops, there was little or no apprehension that the future might hold out a repetition of the conditions of the first world war with added ferocity and intensity of incidence. There was also no appreciation that survival of Britain as a nation might well depend on the expansion of domestic agricultural production in order to lower dependence on imported foods, or at least if there was it had not manifested itself in the form of any effective action.

The course of war soon compelled a more realistic approach and once more it became necessary to stage an impromptu revival of British agriculture with the restricted means available. This led to spectacular achievements and to the augmentation of production by over 40%, represented annually by 500,000 tons more breadgrains, 3 million tons more potatoes, 1 million tons more sugar beet, 6 million gal. more milk and 100,000 tons more eggs. It was achieved by means of wholesale re-equipment of farms and a widespread turnover to mechanisation which enabled the ploughing and cropping of over 5 million comparatively idle acres.

Since the war there has been a recession from the maximum of the war years, not that the need for increased agricultural production on a permanent basis (and not merely as a wartime necessity) is not recognised, but there has been a considerable variation of policy by successive governments and a deplorable lack of appreciation that discontinuity of agricultural policy can never hope to bring about real improvement.

It is a somewhat chastening reflection that so far as concerns wheat production, in 1870 when there were no tractors, only a restricted range and limited supplies of manures and fertilisers, and no pesticides and herbicides to speak of, the country grew 3½ million acres of wheat, a figure which was only equalled in 1944 when the war was at its height. Today, it has fallen once more to only a little over 2 million acres.

The performances of the best of the English farmers go to show how far crop returns can be raised above the present averages if all the various known skills are systematically applied. The present need is, particularly, for enhanced production of animal products, especially meat and animal protein, in achieving this increased production of feeding stuffs, including grass, is the great requirement.

The article concludes by observing that while for many years the British stock farmer has concentrated on converting to animal products feeding stuffs grown in other parts of the world, such as India, Argentina or Australia, the need now is for him to become equally skilful in converting to animal products the inherent wealth of his own land.

Some further reflections

WHILE we can unhesitatingly agree with the foregoing conclusions as far as they go, the ultimate implications must by no means be overlooked. The policy of concentration on industrial production to the disregard of agriculture has had certain definite consequences. It produced a period of great prosperity coupled with an enormous rise in population. Today the population of Britain is roughly 50 million people; 100 years ago, in 1851, it was half this figure, while in 1871 it was roughly 30 million. Moreover, industrialisation is no monopoly of Britain, and for many years Britain was the leading industrial nation of the world and lived largely by processing and manufacturing raw materials imported from overseas and then re-exporting them in manufactured form. There has for long been a growing tendency to undertake processing and manufacture in countries of primary production; indeed, with growing populations this is to be expected and is well exemplified in India which of late years has developed into an important manufacturing country.

This, however, must eventually entail a gradual decline in Britain's manufactures for export and a corresponding decline in her ability to obtain all the food she wants for her population by exchange earned from exports.

The answer seems to be, on the one hand, that the increase of domestic agricultural production must be encouraged by all possible means, including compulsory utilisation to the best effect of all potential agricultural land and restriction of the diversion of such land to non-agricultural uses, which is proceeding unduly rapidly today; on the other hand, it has got to be recognised that maldistribution of population in the British Commonwealth is a powerful contributory factor to present difficulties; and also that a measure of redistribution may in the end have to be accomplished as a prerequisite to survival, the general aim being to secure an ultimate density of population in any particular area that is not too greatly removed from that which the area can support from its own agricultural production. There remains, of course, the overriding proviso that sooner or later a time must come when the world rate of population increase must be attuned to the available resources of land and other things available to produce the food to sustain it.

The grey squirrel

RECENTLY the British Ministry of Agriculture has been moved to issue a warning circular to the agricultural public against the menace occasioned by the rapid increase in the population of grey squirrels, which it is stated are increasing so much that they have now become a menace almost, if not quite, as great as rabbits and rats.

They consume a great variety of food and do much damage in agriculture and forestry. They eat all kinds of fruit and nuts, attack standing grain, dig up bulbs, damage flowers and are responsible for a wide range of miscellaneous damage to trees by stripping bark and eating buds and young leaves. They also prey on the eggs and young of wild birds.

So great has the menace become that the Ministry in collaboration with the National Farmers' Union, the Country Landowners' Association and the Royal Forestry Society have recently launched a campaign aimed at the destruction of squirrels in infested areas and are appealing to all landowners and farmers for support in it.

It appears that at present shooting and trapping are the only really effective means of control. Shooting appears to have advantages, a 12-bore shotgun being the most effective weapon. Poisoning does not seem to enter into the sphere of practical politics. Perhaps in due course some means of poisoning them, as effective as the recently introduced 'warfarin' is reported to be against rats, may emerge as the result of research.

The grey squirrel is a native of the U.S.A. and Canada, and was introduced into the U.K. in the '80s of last century by people who considered it would be an attractive addition to the *fauna* of the countryside; yet another example of the errors into which undue affection for the picturesque and amusing may unwittingly lead, on occasion.

Experimental farms

TOO little attention seems to be devoted to one section of the British National Agricultural Advisory Service's work—the experimental husbandry farms, nine of which are now in existence. The original plans for this type of combined research and demonstration envisaged 18 such farms and there do not appear to be strong fears anywhere that this target will be 'axed' on the grounds of official economy. The nine farms now acquired represent the halfway stage of initiation. They are deliberately representative of different soil types, annual rainfalls and altitudes. Chalk, clay, sand and sandstone, silt and loam are all represented. One farm on clay in Cambridgeshire can expect an annual rainfall of 25 in., but another on clay in Lancashire can reckon upon receiving 55 in. The effects of basic variations in British farm conditions upon the more controllable variations in farm practice can be accurately assessed in future, especially when the nine farms have become 18.

Several long-term experiments are already under way. The value of leys as builders of fertility is to be exhaustively measured, a rotation of arable crops—potatoes, wheat and barley—being used to assess this. Leys will be grazed or conserved and at least two levels of nitrogen treatment will be compared. In the total experiment well over 200 plots will be laid down. Methods of straw disposal will be compared—removal, burning on site, ploughing in and return as farmyard manure—and the fertility effects will be measured over a six-year rotation that includes four cereal crops. Again two levels of nitrogen supply will be brought into the experiment. A third series of long-term plots will study the effects of deep ploughing, though in these the variations in ploughing depths may have to be varied to suit different soil types. The residual effects from phosphatic fertiliser treatments are to be investigated; there will be variations in type of fertiliser, *e.g.* superphosphate, basic slag, etc., and frequencies of dressing will be varied. Similar but rather simpler tests will study the residual effects of potash applications. Another long-term experiment to be carried out at all or most of the farms will rotate crops on various nutrient treatments set to the familiar pattern of nitrogen only, phosphates only, potash only, pairs of these only, etc. As time goes on these plots will have a high demonstration value for visitors. Many shorter-term experiments will also be conducted though these may more often than not be specific to one farm rather than carried out at all the farms.

The Smithfield Show

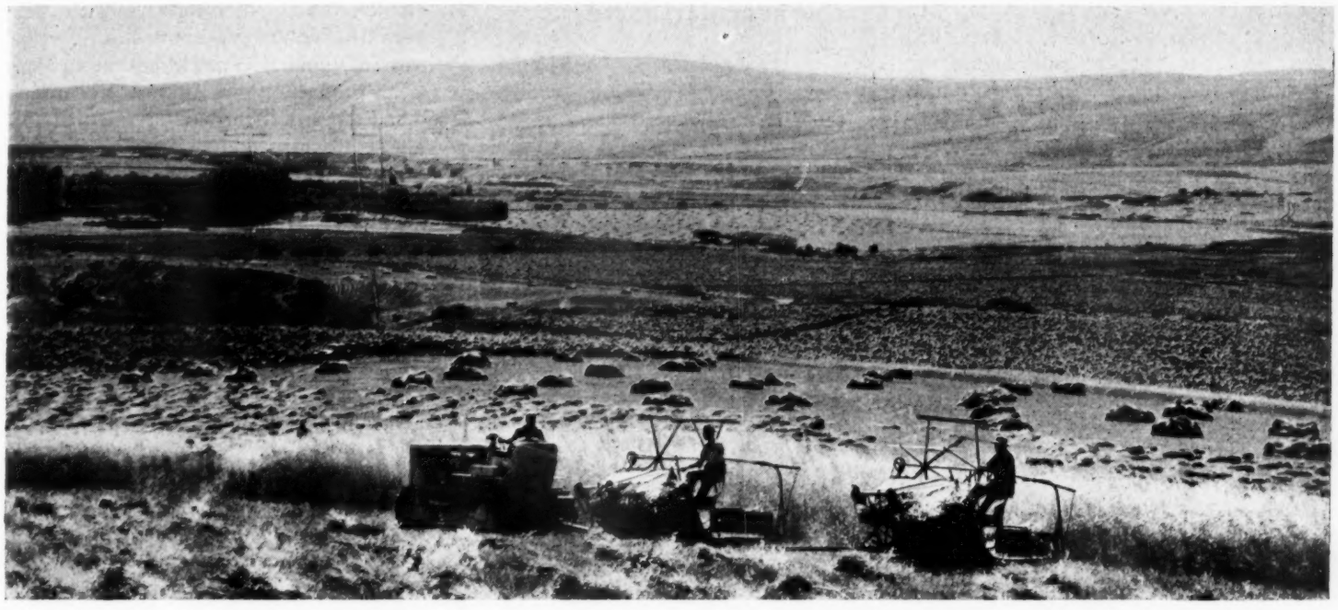
THE Smithfield Show, which was held from December 8 to 12, must by all standards be reckoned the most successful so far held under the new conditions, in which the long established and traditional Fat Cattle Show is combined with an exhibition of agricultural machinery, to form one mammoth whole.

Both on the livestock and the machinery sides the exhibition this year presented certain striking features. After last year, when the display of livestock was so seriously handicapped by the prevalence of foot-and-mouth disease, it was encouraging to see the large and representative collection of livestock exhibits, which showed no falling off from the traditional British standards. It seems that in years to come still larger and more representative shows on this side are likely to become the rule. On the machinery side the show was at least equally remarkable, particularly for the number of new types of agricultural machinery exhibited.

Remarkable, too, were the large attendances. Even on the opening day, which in previous years always appeared to us to some lack of vigour and interest which developed on subsequent days, it was striking to notice the animated groups of interested enquirers and prospective customers at most of the machinery stands.

The only adverse feature was the prevalence, on the days before the show, of the worst London fog for many years which greatly discommoded many of the livestock exhibits and unfortunately led to the death of a number of animals.

Once more we can congratulate the organisers on the successful results of the show, coupling this, however, with the query we voiced last year, *viz.* if this rate of development continues, how long will available accommodation allow this marriage of livestock and machinery to continue, and so to say enable the slaughter ox, the fatted calf and the prize pig to lie down in peace with the tractor, the fertiliser drill and the spraying machine under one roof ?



Mechanised harvesting of hillside wheat with volunteer oats near Oran, Algeria

World Agricultural Production—1951-52

Following the practice established last year, we reproduce below a summary of some of the principal features of the situation in regard to world agricultural production during 1951-1952 and the outlook for the immediate future, based largely upon information contained in the review recently published by FAO.

ONE of the services which FAO renders to the world is the annual compilation of a review of the state of food and agriculture in which salient features of the world situation during each year are summarised and deductions concerning the immediate future outlook are presented.

The sixth of these* has recently been published, and following the practice introduced in our January number last year we present below a short survey on the position largely based upon information contained in the report in question, supplemented where possible by information drawn from other sources.

General

In our review of the position at the end of 1951, we recorded that the immediate outlook for agriculture was uncertain, to say the least of it. Rearmament was creating heavy demands for agricultural raw materials and defence demands, and price inflation threatened to limit resources and reduce supplies of consumer goods; difficulties in regard to payments for raw materials were increasing, food production was not expanding commensurately with the demands created by population expansion, while in many needy regions the *per caput* food consumption had not even regained the wholly inadequate level current before the war. The future was unpredictable in an increasing degree and was largely dependant on military and political developments.

It is at least cause for some measure of tempered satisfaction that, in 1952, although the political situation remained unsatisfactory, the world at least avoided the major catastrophe of the outbreak of a third world conflict, while despite poor weather conditions in many areas, world agricultural production as a whole, excluding the U.S.S.R., was nearly 2% greater than in the preceding year. This kept pace with the increase in world population during this 12-month period.

World production

The main increases occurred in the production of raw materials likely to be in demand for the military effort, such as cotton, rubber, certain oils and oilseeds, jute and certain other fibres, which all showed substantial gains amounting, on the average, to as much as over 14%, compared with the previous year. On the other hand, the increase in production of cereal grains compared with 1951 was little more than 1%. Sugar production was the highest in history and 5% above the previous year's record production of 35 million metric tons.

The total volume of world exports of agricultural products was somewhat lower than in the previous year. Fibres showed a substantial reduction in total exports, but total food exports remained about the same with substantial rises ranging from 5% to 45% in certain products, notably breadgrains, fats and oils, rice and sugar.

Food consumption

Food consumption in most countries showed a further rise, although the improvement in this regard was less than in the previous year. The trends for the past few years suggest that post-war recovery in this regard may be coming to an end. Average *per caput* food supplies appear to be becoming stabilised at lower levels than in pre-war years in the Far

**The State of Food and Agriculture: Review and Outlook*, 1952. Food and Agriculture Organisation of the United Nations, Rome, 1952.

East, the Near East, parts of Africa, and in parts of Europe. In under-developed areas cereals and starchy roots continue to constitute the bulk of an inadequate food supply. The two charts give an indication of the position.

Apart from minor fluctuations the trend of food prices in most countries has continued to move steadily upward, a tendency which has been strengthened in a number of countries by reductions in food subsidies to consumers and by the raising of prices paid to farmers.

As a result the poorer sections of populations are finding it increasingly difficult to buy the more nutritious kinds of food since they are more expensive. In many parts of Europe meat consumption still falls a long way short of pre-war.

In the undeveloped areas, *e.g.* in India, the daily calorie intake is in some cases below 2,000, and in countries in which calorie intake is adequate diets often do not show enough protective foods; in many parts of the world serious conditions originating from protein deficiency prevail. This is known to be responsible for the high mortality among children from six months to five years of age in Africa, Central America and probably elsewhere.

Although production and employment continued at high levels the sharp upward movement in agricultural prices which characterised the previous year was no longer evident. Except for military goods demands both for consumption and stockpiling were less strong and prices for raw materials generally declined relative to prices for finished products. This, combined with lower purchases, reduced dollar earnings by non-dollar exporting countries and helped to increase dollar shortages.

The main producing regions

North America

During 1951-52 agricultural production in the U.S.A. advanced about 2%, while in Canada it increased by 13%. The gains are largely attributable to increases in cotton, tobacco, oilseed and truck crops in the U.S.A. and to large grain crops in Canada. Supplies of food and other crops of domestic and foreign origin were adequate to satisfy fully all domestic and export demands.

The tables 1 and 2 show the total and *per caput* production of agricultural products in the U.S.A. and Canada for the past six years, in terms of production pre-war taken as 100.

In the U.S.A. production of food grains was 32.6 million tons, compared with 33.2 million tons for the previous season. The wheat crop was 26.9 million tons, or 8% below the average of previous years. The rice crop at 2 million tons was the highest recorded and 13% above the previous year. Despite declines in peanut and soya bean production, the total oilseed production at 16.3 million tons exceeded by 7% that of 1950-51.

In Canada yields per acre for most crops were significantly higher than in the previous year, mainly as the result of favourable weather, except in the extreme west where it was unfavourable for harvesting. Potatoes, sugar beets and sunflowers showed lower returns mainly because smaller acreages were planted.

Wholesale prices for farm produce declined by about 3% in the U.S.A. and 8% in Canada, but despite this farm incomes increased in both countries (in the U.S.A. by 14% and in Canada by 27%) as the result of larger marketings.

The volume of agricultural exports from the U.S.A. increased by 19% during 1951, while the volume of imports declined and

TABLE 1

TOTAL AND *Per Caput* AGRICULTURAL AND FOOD PRODUCTION IN THE UNITED STATES, 1946 TO 1951

Items	1946	1947	1948	1949	1950	1951
		(. . .	1935-39	= 100	. . . .)	
Total agricultural production	137	136	138	140	137	140
Food production	140	140	134	137	138	138
Population	110	112	114	116	118	120
Per caput agricultural production . .	125	121	121	121	116	117
Per caput food production	127	125	118	118	117	115

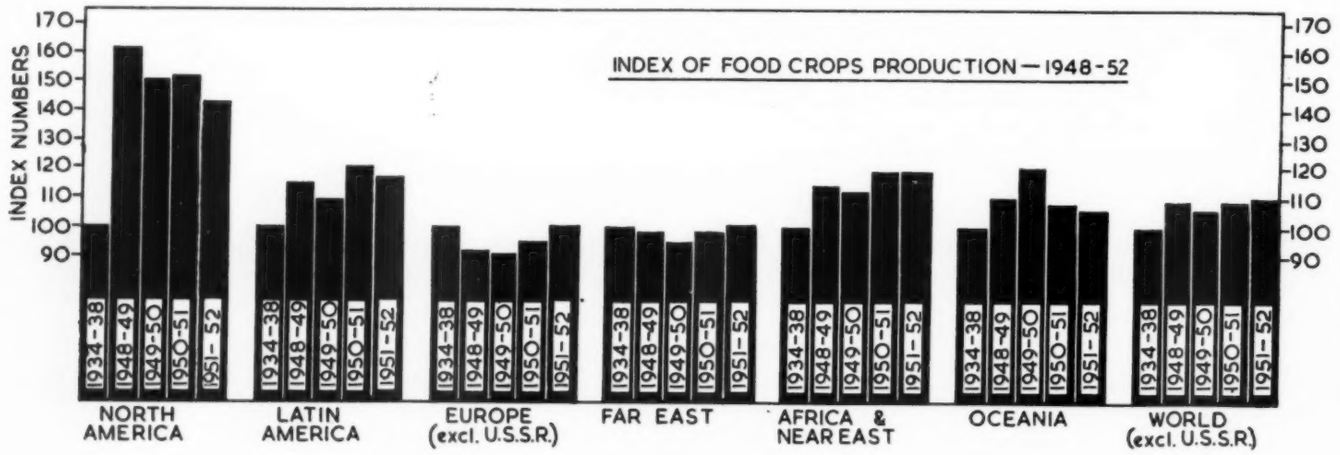
Source: U.S. Department of Agriculture and United Nations.

TABLE 2

TOTAL AND *Per Caput* AGRICULTURAL PRODUCTION IN CANADA, 1946 TO 1951

Items	1946	1947	1948	1949	1950	1951
		(. . .	1935-39	= 100	. . .)	
Total agricultural production	126	116	125	122	140	157
Population	111	114	117	119	122	124
Per caput agricultural production . .	114	102	107	103	115	127

Source: Dominion Bureau of Statistics and United Nations.



Index numbers are based on the production of wheat, rye, oats, barley, maize, rice, potatoes, sugar and oils. Uniform price weights are applied to total output without deduction for quantities fed to livestock

was 4% less than in the previous year. Canadian exports exceeded those of the previous year by 25%.

The outlook still continues to be dominated by the defence programme, and despite the impending change in administration as the result of the recent presidential elections, it seems likely that the demand for agricultural products will continue to be sustained at a high level. Productive capacity will be higher in 1952-53 and work and wage rates may show some further increase, favouring high levels of production and increased marketing and consumption of farm produce. The prospective termination of the expansion of defence expenditure in 1953-54 may, however, cause some decline in demand both in the U.S.A. and Canada.

The already tight farm labour situation may become more difficult as more and better job opportunities occur in non-agricultural occupations, and further rises in farm wages are in consequence to be expected.

Farmers' supplies of materials such as machinery, fertilisers, pesticides and fuel may show some further rises due to a light supply situation arising from world shortages and the demands of the defence programmes.

Western Europe

With the major exception of the United Kingdom, agricultural production has generally returned to the pre-war pattern. Farm production exceeded that of 1950-51 by about 2% and that of the 1934-38 average by about 12%. As a result the *per caput* production exceeded the pre-war level. The following table shows the index numbers of total and *per caput* agricultural production.

TABLE 3
INDEX NUMBERS OF VOLUME OF TOTAL AND *Per Caput* AGRICULTURAL PRODUCTION IN WESTERN EUROPE, 1946-47 TO 1951-52

Year	*Agricultural production*	*Population*	*Production per caput*
	(1934-38 = 100)		
1946-47 ..	86	106	81
1947-48 ..	84	107	79
1948-49 ..	95	108	88
1949-50 ..	103	109	94
1950-51 ..	109	110	99
1951-52 ..	112	111	101

Gross output of livestock products exceeded the pre-war average by 7%. Milk production was greater than in 1950-51 by 2% and exceeded the 1934-38 average by 8%. The reduction in horse numbers, due to increased mechanisation, led to a considerably decreased production of oats and increased production of barley, reflected in considerably increased production of pork, poultry and eggs. In general, livestock production per unit input of food has increased since before the war, and this combined with better utilisation of grasslands and of crop waste products, such as sugar beet crops, has greatly lessened the dependence on imported foodstuffs.

Thai farmers at the Bang Khen Agricultural Experiment College transplanting rice by hand. FAO is attempting to discover which variety of rice will grow best under various conditions

Average production per acre of field crops is markedly higher than before the war, except in the Mediterranean countries, with the largest improvement in Central Europe. This is largely due to increased use of fertilisers and mechanisation.

The short-term trend is, however, somewhat different with yields showing declining trends in Central and Northern Europe and upward trends in the Mediterranean regions. How far this merely reflects short-term changes due to weather fluctuations, etc., is not yet clear.

Fertiliser consumption per acre has increased by about 50%, as compared with pre-war; tractor numbers are about four times greater than in 1938, while in Great Britain they are six times as numerous.

Prices received by farmers for the major crops, notably cereals and sugar beet, were higher than previously, while livestock prices were sustained but did not rise commensurately with those for crops. Farm incomes increased somewhat in most countries, but this was offset to an extent owing to substantial increases in wages and other farm costs.

Eastern Europe and the U.S.S.R.

Collectivisation slowed down somewhat, but the area under state farms continued to expand rapidly, especially in Poland and Eastern Germany. In Czechoslovakia and Hungary the proportion of cultivated land accounted for by collective and state farms appears to have reached 20% to 30% and in Poland about 15%; in Roumania it is small compared with neighbouring countries. In Eastern Germany, although the number of nationally owned machine stations has increased, no deliberate policy of collectivisation on the customary pattern appears as yet to have commenced.

In the Soviet Union itself more attention has been paid to the transfer of livestock from private to collective ownership. In Yugoslavia, on the other hand, there has been a marked change of policy and the type of co-operative now being encouraged approximates much more to the Western than the Soviet model, with peasants combining for buying and selling and the provision of credit; existing co-operative farms are paying their workers more to provide greater incentives; compulsory state purchase has been abolished; freer prices provide a new incentive for sales, while taxation on earnings has been modified and reduced.

Although agricultural production has showed marked recovery since the end of the war, it is still below pre-war averages. The bread grain harvest is reported to have been the best since the war, and yields were substantially greater than in 1950 except in Poland where some crops had poor yields owing to drought. Areas under industrial crops such as sugar beet and tobacco are rapidly expanding, while in Bulgaria areas under cotton, rice, hemp and sugar beet showed marked increases. In Poland and Czechoslovakia planned

increases in sugar beet and some other crops were not obtained. Improvement in crop production has not yet been reflected in increased livestock production, and shortages of meats and fats were reported in several Eastern European countries.

Trade within the region is reported to have been intensified, but trade with Western Europe was subject to growing restrictions.

The Soviet Union exported 3,000,000 tons of grain to Western Europe in 1951. This was 27% more than in the previous year, the increase going chiefly to the United Kingdom, Italy and Finland; Poland, Hungary and Yugoslavia, on the other hand, shipped less grain and exports from the Eastern region as a whole were in aggregate less by 100,000 tons than previously.

Exports of wheat from the U.S.S.R. included about 180,000 tons to countries outside Europe, mainly to Egypt.

The probable general position in regard to crop production is shown in the following table:

TABLE 4

CROP PRODUCTION: EASTERN EUROPE*

Commodity	1934-38	1950	1951
	(. . *million metric tons* . .)		
Wheat	14.0	12.8	14.6
Rye	11.8	11.1	11.4
Barley	5.7	4.4	4.9
Oats	6.9	5.1	5.4
Maize	12.2	9.0	12.3
Sugar	2.6	3.2	3.1
Potatoes . .	67.0	62.9	53.6
Total, wheat equivalent	62.0	55.6	57.3
Wheat equivalent *per caput* (kg.)	371	339	335

Note.—Statistics are mostly derived from unofficial sources.

*Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Roumania and Yugoslavia.

Latin America

In Latin America the emphasis is on agricultural expansion. Of late years industry has expanded more rapidly than agriculture, but there is now a growing realisation that agricultural development must not lag behind.

The total area planted and harvested in 1951-52 was larger than in the previous year, except in Argentina where acreages dropped significantly and where unfavourable weather caused a heavy setback in production. This offset progress elsewhere and overall farm production in Latin America as a whole was less than the previous year.

The decline in production affected exports rather than domestic supplies, and because of increased imports the latter were higher than in the previous year.

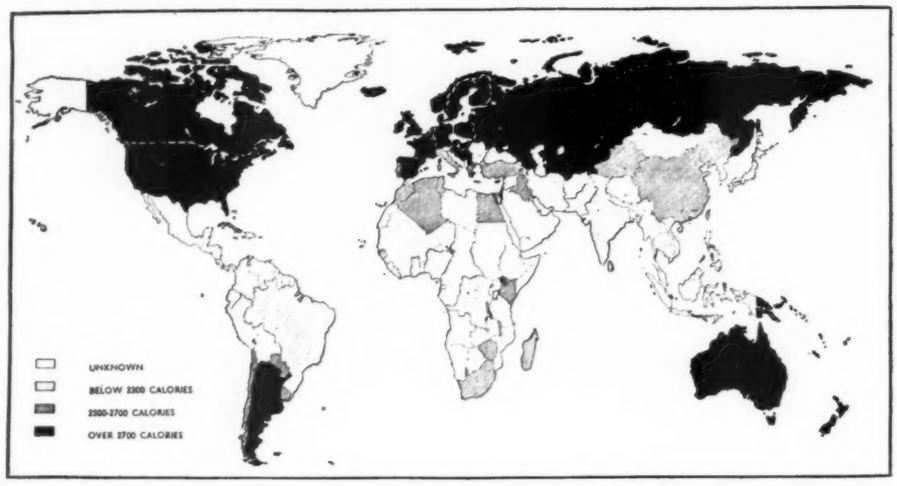


Chart showing per caput food consumption pre-war

Industrial production continued to expand and was accelerated in Chile, Mexico and Peru. For the region as a whole the increase in industrial production more than offset the decline in agricultural production. These internal and external factors contributed to the inflationary pressures and pushed the general level of prices upwards. Early in 1952 the cost of living was higher than the previous year in all countries except Colombia.

On the whole, however, apart from Argentina, total agricultural production has increased appreciably since the end of the war. In 1951-52 food production was about 22% above pre-war level, but on account of population growth the *per caput* food production is some 10% lower. The output of sugar was a record one, representing a 12% increase on the 12.4 million metric tons produced in the previous year. The coffee crop also improved by about 5%, the gain coming from the Brazilian output. Production of cotton was 9% higher than in 1950-51, while oilseeds also showed an appreciable gain, despite a significant decline in Argentine production of linseed and sunflowers. Persistent drought and heat have impaired wheat production, and in Argentina particularly there has been some considerable reduction in livestock numbers.

The dominant factor in the outlook is probably Argentina, where the new price policy is directed to stimulate and increase agricultural output. Provided weather conditions are favourable, it is anticipated that in the future considerable expansions will occur in the whole region. The general position in regard to exports and imports is shown in Table 5.

TABLE 5

NET TRADE IN MAJOR AGRICULTURAL COMMODITIES, LATIN AMERICA: 1934-38, 1950 AND 1951

— = Net Exports + = Net Imports

Commodity	*Average* 1934-38	1950*	1951*
	(*thousand metric tons*)		
Sugar	— 3,790	— 6,570	— 7,050
Coffee	— 1,370	— 1,394	— 1,490
Maize	— 6,590	— 330	— 570
Vegetable oils and oilseeds . .	— 549	— 447	— 551
Meat	— 824	— 538	— 468
Cotton (ginned)	— 265	— 231	— 285
Barley	— 380	+ 15	— 285
Cocoa	— 196	— 216	— 185
Oats	— 400	— 230	— 170
Hard fibres . .	— 109	— 179	— 140
Wool (greasy) . .	— 216	— 280	— 109
Rye	— 120	— 200	— 100
Millet and sorghum . .	— 50	— 20	— 80
Tobacco	— 46	— 58	— 58
Jute	+ 37	+ 20	+ 25
Rubber	— 7	+ 33	+ 41
Dry beans . .	— 6	— 14	+ 50
Animal and Marine oils . .	— 70	+ 60	+ 120
Potatoes . .	+ 156	+ 230	+ 160
Rice	+ 290	+ 180	+ 250
Wheat	— 1,700	+ 500	+ 2,100

*Trade data relate to calendar years with the exception of wheat, rye, barley, maize and oats, where the data for trade season July-June beginning in the year stated have been used.

Africa

Africa naturally divides itself into three regions: (*a*) North Africa, which forms part of the Mediterranean economies; (*b*) the intra-tropical Colonial middle belt; and (*c*) South Africa, which is the only part having an industrial region. Taken as a whole food crop production has shown a steady rise in the post-war period, but during the last two years increase of population has slightly reduced it *per caput*. Production in 1951-52 shows appreciable increases over last season. Also some important changes in the situation

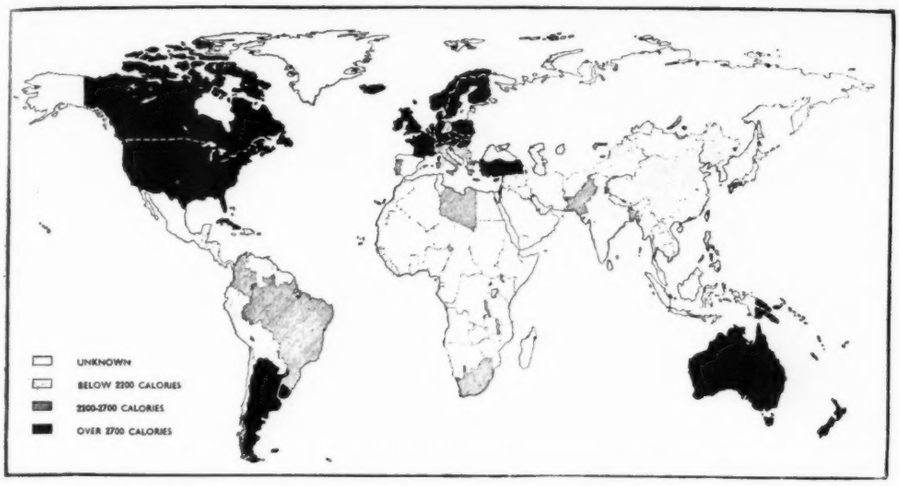


Chart showing per caput food consumption post-war (1950-51)

have taken place, of which the most important is the high production of oil crops which is approximately 25% above the previous year. Table 6 shows the outstanding features of the situation.

TABLE 6
AGRICULTURAL PRODUCTION IN AFRICA

Commodity	*Average* 1934-38	1949-50	1950-51	1951-52
	(. . *thousand metric tons* . .)			
Cereals* . .	18,810	22,010	21,800	21,200
Millet and sorghum . .	7,770	7,820	8,130	8,100
Maize . .	4,490	6,040	5,560	4,850
Wheat . .	2,520	2,810	3,130	3,040
Groundnuts (unshelled basis) . .	1,476	1,908	1,831	2,228
Palm oil† . .	300	420	430	440
Palm kernels	670	730	770	‡670
Olive oil . .	67	155	75	91
Cotton . .	137	196	208	213
Cocoa . .	484	487	521	450
Coffee . .	119	204	249	257
Tea	9	16	20	‡20
Raw sugar . .	1,034	1,300	1,455	1,350

*Includes also rye, barley, oats and rice.
†Calendar year, from export data.
‡Estimate.

Cereal production amounted to 21.2 million tons, 3% below the previous year. In North Africa reduction of crops in Algeria and Tunis was offset by good crops in Morocco, while average crops in South Africa were offset by a decline of 40% in East Africa. Here heavy rains during harvesting damaged the crops, while in West Africa conditions were particularly favourable and crops were good.

Cacao production in West Africa was well down compared with the previous year and less than the pre-war average. The coffee crops showed an increase against last year, while tea production was slightly increased.

So far the pre-war pattern has not been fully restored. In French North Africa pre-war production had been reached by 1951, but was accompanied by a 33% increase in consumption due to population growth in tropical Africa. The emphasis continues to be on exports and pre-war levels have been surpassed. In Southern Africa domestic consumption is rising faster than production.

In the long run additional food supplies for export are most likely to come from tropical Africa through the operation of long-term development plans aiming at productive investment. Numerous development schemes are in operation and particular attention is being paid to the expansion of food supplies, while the growing agricultural processing industries are also likely to contribute to the expansion.

Two factors do not encourage optimistic expectations: (*a*) The shortage of capital goods and their rise in price as a result of rearmament, which is slowing down the development plan and (*b*) the growth of internal markets for agricultural products created by the expanding mining industries in the Belgian Congo, the Rhodesias, Tanganyika and the Union of South Africa.

The Near East

In most of the Near East progress in industry has been greater than in agriculture. The outstanding agricultural development of 1951 was the expansion of the area cultivated as a result of favourable prices for farm products, the increase in the number of tractors, and the provision of additional irrigation. Most of the expansion took place in Turkey, Iraq, Syria and South Arabia, where pressure of population is high. Egypt concentrated on commodities like cotton at the expense of food crop production. The situation is shown in Table 7.

TABLE 7
AGRICULTURAL PRODUCTION IN THE NEAR EAST

Commodity	*Pre-war*	1949	1950	1951
	(. . *thousand metric tons* . .)			
Total grains*	20,800	21,800	24,200	25,400
Wheat . .	9,500	9,200	10,600	11,700
Barley . .	4,200	4,400	5,000	5,300
Maize . .	2,300	2,300	2,200	2,500
Rice . .	1,600	2,300	2,500	1,700
Pulses . .	900	1,100	1,000	1,000
Sugar . .	220	360	410	460
Citrus fruits	770	640	750	800
Cotton (ginned)	550	600	680	640
Tobacco . .	85	130	125	115

*Including rye, oats, millets and sorghum.

A counter-effect was the serious drought which prevailed in 1950-51 in many middle Eastern countries. On the whole, the total volume of food and agricultural production was only slightly greater than in the previous year, as the rapid population growth since pre-war times allows only a narrow margin of improvement for production.

Despite the large volume of production, agricultural exports were smaller than in the previous year; cotton prices in Egypt slowed down exports. Other countries in these regions also experienced marketing difficulties. It seems unlikely that food production will expand much in the immediate future. In Turkey the prospects for another bumper crop of grains have been dimmed by a prolonged drought in the central Anatolian Plateau, although late rains have eased the situation. In Egypt the area sown to wheat is nearly 45,000 hectares less than in 1951. The area under rice will be lower. In Egypt far-reaching measures have been taken to counter the danger of food shortage resulting from an extension of cotton cultivation at the expense of food crops. The cotton area for the next three years has been reduced to one-third of the total area cultivated, while minimum acreages to be sown to wheat have been laid down.

The indication is that the cotton boom is subsiding following a sharp decline in price, and in Syria measures have been taken to regulate cotton cultivation.

On this account the short-term outlook for agricultural expansion is not encouraging. There will probably be severe annual fluctuations of production during the next few years, while political instability in many parts of the region requires to be taken into account.

The Far East

Notwithstanding unfavourable weather in the Indian sub-continent and civil unrest in many parts of south-east Asia,

total crop production just reached pre-war level, and represented the highest point in the gradual upward trend since the end of the war. Excluding China, the total volume of food production was 3% above pre-war average, but on a *per caput* basis it has declined. Table 8 shows the position.

Despite increased efforts to grow more rice, production has failed to expand in proportion to the area planted, mainly because of the absence of adequate water resources. With the high rate of population growth, the region which had a considerable export surplus of grain before the war has become dependent on imported grain supplies from the Western Hemisphere, which in 1951 reached the record total of 7 million tons. The food situation in several countries remains precarious by reason of drought and near-famine in parts of India and Pakistan. Political instability hampered production in many places. In the large rice surplus countries of Burma, Thailand and Viet Nam production increased appreciably, but export availabilities are expected to be lower than in the previous year. Seven years after the war a quarter of Burma's rice area remains still abandoned to jungle and, partly as a result of land nationalisation, private capital is not available for financing the rehabilitation of the industry. Thailand has been able to expand its rice production, but the economy of Viet Nam is dominated by the political situation.

The decline in demand and the sharp fall in export prices for the region's raw material exports decreased foreign exchange earnings, and with the rising prices of imported foods trade terms have become increasingly adverse. These changes have affected especially the economies of Ceylon and Malaya, both of which depend heavily on the exports of a few specialised crops, and import from one-half to two-thirds of their basic food requirements. Both countries are making considerable efforts to expand the domestic production of rice.

Assured markets in the United States for copra and sugar from the Philippines have sustained expansion and rehabilitation in these two industries. In Indonesia agricultural production was at a higher level than in the previous year, but production of various export crops on estates did not show progress.

Production and export of rubber rose to a record high level in 1951, and as smallholders produce three-fifths of Indonesia's rubber and all the copra, smallholding incomes have increased, but this was offset by rising prices for food and costs of living.

The economic outlook for the region depends heavily on the raw material demand from the West and with the recent fall in prices of raw materials and a relative increase in food prices greater efforts will have to be devoted to production of food crops. In the present unsettled conditions, however, an expansion of rice supplies remains problematical, while the high rate of population growth make the problem more difficult and the outlook more uncertain.

TABLE 8

CROP PRODUCTION IN THE FAR EAST

Items	1934-38 (*Average*)	1948-49	1949-50	1950-51	1951-52
	(. . . *million metric tons* . . .)				
Grain crops					
Rice (cleaned basis)	100.6	99.6	98.2	97.5	98.3
Wheat	34.8	35.2	32.6	36.6	38.1
Coarse grains*	65.0	62.7	61.0	61.3	63.1
TOTAL	200.4	197.5	191.8	195.4	199.5
Other crops					
Potatoes and root crops	41.0	53.2	51.8	52.9	53.5
Vegetable oils and oilseeds—oil equivalent	8.1	7.6	7.5	7.9	8.0
Sugar—raw equivalent	7.3	5.7	5.9	6.5	6.8
Tea	0.7	0.6	0.6	0.7	0.7
Tobacco	1.5	1.4	1.2	1.2	1.1
Raw materials					
Cotton	1.9	1.1	1.2	1.4	1.6
Jute	2.0	1.4	1.3	1.5	2.1
Rubber	0.9	1.5	1.4	1.8	1.8

*Includes maize, barley, oats, millets and sorghums.

TABLE 9

INDEX NUMBERS* OF VOLUME OF TOTAL AND *Per Caput* AGRICULTURAL AND FOOD PRODUCTION IN AUSTRALIA AND NEW ZEALAND, 1946-47 TO 1951-52

Items	1946-47	1947-48	1948-49	1949-50	1950-51	1951-52†
	(. . . 1934-38 = 100 . . .)					
Total agricultural production‡	92	107	108	115	111	105
Population	110	112	114	117	120	124
Per caput agricultural production	84	96	95	98	93	85
Food production	91	107	108	115	111	104
Per caput food production	83	96	95	98	93	84
Production by major groups:						
Food crops§	81	137	124	138	122	109
Cereals‖	79	145	124	140	122	109
Meat and milk¶	95	99	104	108	108	104
Fats and oils	85	87	92	99	103	97
Wool (greasy)	103	107	105	113	114	113

*These index numbers are weighted by values. They are preliminary.
†Preliminary.
‡All groups below.
§Cereals, potatoes, dry peas and sugar.
‖Wheat, maize, barley, oats and rice.
¶Meat on calendar year basis. Production of meat for one year is combined with production of milk for the season beginning at the middle of the same year, *i.e.* production of meat in 1946 with production of milk in 1946-47.

Oceania

The two most important factors in this region were the serious decline in wheat production in Australia and the sharp drop in export income in both Australia and New Zealand. One of the factors contributing to a slower rate of development and even a decline in Australian agriculture is the great emphasis placed on development of secondary industries, while price policies, high freight rates, inadequate transportation facilities, heavy taxation on farm production and lack of materials, machinery and labour have all been contributing factors, as has also the rapid growth of population and the consequent increase in domestic consumption. As a result, Australia cannot meet its shortcomings under the national wheat agreement. With falling prices and reduced output, total farm income declined appreciably and with rising costs net incomes will probably show a still greater decrease.

Assuming normal weather conditions, however, it seems that the coming year's agricultural production may show a further increase in the fulfilment of the Australian programme of development. The object of this is to increase agricultural production by 20%. The farm labour situation is showing some signs of improvement and immigration policy is being directed to bring into Australia more workers with farming experience, while prices for agricultural products are being revised to

(*Concluded on page* 38)

The Australian Wheat Crop

L. T. SARDONE

Production in Australia plays quite an important part in the world's wheat supplies. During 1951-52 the Australian output of wheat fell somewhat below the high average established in previous years. The circumstances of wheat production in Australia are reviewed in the following article, which is of special interest in view of the present position of world wheat supplies.

WHEAT is one of Australia's main exports, and is the most important agricultural product cultivated in that country. More time is devoted to the subject in the Australian Federal Parliament than to any other rural topic. Reports about wheat in the daily press are frequent, as it is the one absorbing topic of hundreds of thousands of Australians.

The cultivation of wheat in Australia began with British settlement in 1788. The coastal area of New South Wales was poor wheat country, and when settlement was established in Tasmania in 1805, readier access to good farmlands led to more rapid growth of the industry.

By 1820 Tasmania was able to supply the deficiency of wheat in New South Wales and until 1850 it remained the chief wheat-growing area in Australia. The settlement of South Australia in 1836, however, led to the opening up of the good wheatlands of the coastal plains of St. Vincent's and Spencer's Gulfs. With ready access to sea transport, South Australia remained, from 1850 to 1890, the chief wheat-growing State.

The opening of lands to cultivation by selection Acts, and the building of railways into the interior, however, enabled first Victoria, then New South Wales, to forge ahead in wheat production. Western Australia followed after 1900, as population rose rapidly following the gold discoveries.

In the ten years 1930-39 New South Wales led in wheat acreage and production. Victoria and Western Australia came next, although their wheat areas were smaller than in South Australia. Queensland has only a tenth of the New South Wales acreage, while Tasmania now produces very little wheat.

Production conditions

The areas suitable for wheat cultivation are determined broadly by the incidence of winter and spring rains, and the Darling Downs in Queensland mark the northern limit. In the course of settlement, wheat cultivation has moved from the coastal areas in the east across the mountains, until checked by climatic conditions in the 10-15 in. rainfall belt.

The early extension of wheat growing was first a matter of pushing into the interior in the southern and south-eastern areas. Australian farmers showed resource in devising cheap and effective methods of clearing, cultivating and harvesting their crops. High wages in South Australia stimulated John Ridley to invent the stripper in 1844, which later developed into the complete harvester devised by H. V. McKay in 1884, and manufactured in his works. The use of a roller to break down light mallee scrub is attributed to a South Australian farmer, while the stump-jump plough is credited to another, R. B. Smith, in 1876.

Bencubbin wheat, a variety finding favour in several Australian States, which has been known to yield as much as 42 bushels to the acre in western-central New South Wales

Cultivation problems

When, towards 1900, the area of cultivation began to reach Goyder's Line (10-in. rainfall), the use of 'dry farming' (conserving moisture to the utmost) enabled Australian farmers to use land for wheat growing which would have been regarded as quite impossible 50 years earlier. But already by this time the older wheatlands had encountered serious problems. By about 1870 South Australian farmers found that the high yields of the early years from virgin soils were not being maintained, and fallowing was not sufficient to restore them.

The fact is that Australian soils are generally somewhat lacking in phosphates, and phosphorous deficiency was one of the main causes of declining yields. These fell to very low levels in South Australia between 1875 and 1900 and then, as superphosphate came into general use, they gradually recovered. Today Australian farmers use more than a million tons of 'super' a year.

Scientific help

The improvement of yields since 1900 was largely due to two scientists, Professors Gustance and Lowrie, of the Roseworthy (South Australia) Agricultural College, who advocated the use of superphosphate. It is also due in part to the work of the plant breeders who have followed in the footsteps of William Farrer. Farrer did pioneer work from 1886 in breeding strains of wheat which would resist the ravages of rust, caused by excessive summer rains. His work was recognised by the Department of Agriculture in New South Wales, and the Federation strain of wheat which he evolved showed what the plant breeder could do for the industry. State Departments of Agriculture now carry on the work, and are continually improving strains of wheat for particular areas and supplying them to growers. The Commonwealth Council for Scientific and Industrial Research, as well as the universities and agricultural colleges, also bring the aid of science to wheat growing.

Farm production

By 1914 the Australian wheat industry seemed to have solved most of its technical problems and the area under cultivation was increasing rapidly. While yields per acre were not high, the cost of production per bushel was still low, and this enabled Australian wheat to sell on the world market.

TABLE 1

WHEAT FOR GRAIN: ESTIMATED AREA SOWN PRODUCTION AND AVERAGE YIELD 1951-52

State	*Area acres ('000s)*	*Production bushels ('000s)*	*Average yield per acre*
New South Wales	2,748	41,400	15.07
Victoria	2,550	46,000	18.04
Queensland ..	400	6,600	16.50
South Australia ..	1,530	27,250	17.81
West. Australia ..	3,200	40,000	12.50
Tasmania ..	5	100	20.00
Australian Capital Territory ..	1	10	10.00
Total ..	10,434	161,360	15.47

The typical wheat farm was 600 to 1,000 acres in area, and its size permitted economical use of labour-saving machinery for sowing, cultivation and harvesting. Thus labour costs per bushel were kept down, but capital outlay was high. Land and plant were often bought on credit, and the interest burden could become serious in times of poor harvests or low prices.

Sowing

Whilst it would not be possible in this article to describe in detail the methods as used in each of Australia's wheat-growing States, it can be said that in most of the States wheat is almost universally drilled at 7-in. row spacing by means of standard grain drills of varying size. Drilling enables the seed to be placed in contact with moist soil at the desired depth, with ample covering to protect it from loss of moisture and from attack by birds and animals. Where the soil is in favourable condition drilling will ensure excellent germination and result in a very considerable saving in seed as compared with broadcasting.

Two types of drill at present in general use are the disc drill and the ' combine ' or cultivator-drill. The combine drill has been a great boon to wheatgrowers, especially on soils which are inclined to run together after rain. On weedy soils the use of this implement obviates the necessity for two separate operations of final cultivation and sowing.

The most satisfactory planting rate varies somewhat in each State and district, and also from one variety to another. The overall variation, however, is not very great and the average rate lies between two-thirds of a bushel and one bushel per acre. For April-May plantings in some districts, 40-50 lb. of seed per acre will give an ample stand; for later planting, in which stooling is likely to be less pronounced, it is customary to increase the seeding rate to 50-60 lb. per acre. In drier districts lighter stands are often more successful, and these rates can profitably be reduced to 30-35 lb. for later planting.

Weathered grain and dry-pickled grain will not run as freely through the drill as a bright sample of untreated seed. Growers find it advisable, therefore, before commencing sowing operations, to check the calibration of the drill by making trial sowings with a few lb. of each variety to be used. A calculation based on a weighed quantity of seed and the area covered by the time the grain box has emptied, readily provides the actual sowing rate for the particular gearing used. Such work should be carried out well ahead of planting time, the seed being run out onto a piece of spare ground. Where germination percentages fall below 90, growers increase the planting rate to compensate for the faulty seed.

The accompanying table shows the principal varieties planted in each of the four main Australian wheat-growing States for 1950.

TABLE 2

PROPORTIONS OF PRINCIPAL VARIETIES OF WHEAT AUSTRALIA 1950 SOWING

New South Wales Variety	%	*Victoria Variety*	%
Bencubbin ..	35.73	Quadrat ..	38.27
Gabo ..	13.97	Insignia ..	22.50
Kendee ..	6.63	Pinnacle ..	15.04
Ford ..	5.02	Bencubbin	7.06
Charter ..	4.89	Magnet ..	6.21
Celebration	4.32	Pindar ..	2.03
Bordan ..	3.91	Diadem ..	2.00
Magnet ..	2.81	Baldmin ..	1.55
Quadrat ..	2.71	Ghurka ..	1.52
All other ..	20.01	All other ..	3.82
Total ..	100.00	Total ..	100.00

South Australia Variety	%	*Western Australia Variety*	%
Bencubbin ..	17.97	Bungulla ..	29.60
Gabo ..	14.01	Bencubbin	24.89
Warigo ..	8.56	Gluclub ..	13.24
Quadrat ..	4.95	Kondut ..	8.37
Waratah ..	4.62	Koorda ..	3.33
Reldep ..	4.30	Eureka ..	2.91
Scimitar ..	4.07	Ranee ..	2.61
Marathon ..	3.89	Wongoondy	1.73
Gluyas ..	3.64	Merredin ..	1.36
All other ..	33.99	All other ..	11.96
Total ..	100.00	Total ..	100.00

Cultivation

The harrowing of the growing crop can generally be carried out with safety as soon as the young plants are about 6 in. high and have become firmly established.

Though harrowing certainly drags out a percentage of the wheat plants, when the stand is not already too thin no damage results. It destroys weed seedlings, induces deeper rooting and possibly increases tillering, which advantages will, under most conditions, more than make up for any damage done. Many Australian growers are not in favour, however, of harrowing the young wheat crops, and the practice is not recommended for soils which are inclined to bake and run together. It is never attempted in those cases where stubble conservation is adopted to combat soil erosion.

Where harrowing can be done, the operation is generally carried out across the drilling in order to secure the best results and reduce plant injury to a minimum. Where fields have been planted by the common method of ' round and round ' drillings, harrowing is done across the direction of the longest rows.

The most common wheat weeds in Australia are wild oats, wild turnips, Hexham scent, and climbing buckwheat or black bindweed.

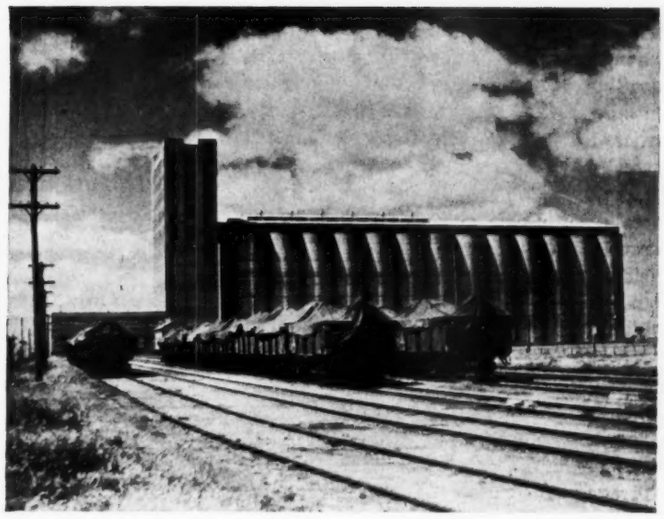
Rotation of crops is, of course, carried out in all States. In Victoria and South Australia a good deal of barley is sown, while in New South Wales the rotation is usually oats, wheat, fallow.

Harvesting

The crop is ready for harvesting when the grain has become hard and dry; this can normally be ascertained by biting or by noting the effect of pressure with the thumb nail. Should the crop have ripened unevenly, the grain tested is taken from the latest maturing section of the field. Ripe grain which has been dampened by rain is allowed to harden again before it is harvested. Once the grain is in satisfactory condition for harvesting, no time should be lost in getting the crop off, as the risks of severe loss through hail, thunderstorms and bushfires in many districts are very real at this period of the year.

The advent of the modern header-harvester has greatly increased the safety factor, and this machine, which cuts, threshes and cleans the grain in one operation, has revolutionised wheat harvesting. Even its predecessor, the stripper, which itself provided a great advance upon previous harvesting methods, was much slower in operation and more limited in its effectiveness. Where soil was damp at harvest time the stripper was unable to remove the heads without pulling whole plants out of the ground, resulting in choking of the comb. The modern header has proved itself able to handle most satisfactorily, and with little loss of grain, crops which are weedy, badly lodged, or poorly anchored in moist soil.

Many makes of machines, all eminently suited for local conditions, are available on the Australian market. The swathe



(*Top left*) **Part of a 500-acre crop of Border wheat in the Forbes district of New South Wales, which won a State-wide competition, yielding 49 bushels to the acre.** (*Top right*) **Wheat terminal storage at the port of Geelong, Victoria, with total storage capacity of 4 million bushels.** (*Bottom left*) **12-ft. headers moving through a 4,000-acre crop of Bencubbin on a 17,000-acre farm near Forbes, N.S.W.—Australia's biggest wheat farm.** (*Bottom right*) **Diesel-driven semi-trailer used to help harvest wheat on a farm in northern Victoria**

cut by such machines ranges from 6 to 14 ft. Most may be hauled by either horse teams or tractor, but tractors are almost universally used now on account of the steadier power output, the greater possible speed and the longer hours that can be worked.

The only undesirable feature about the header-harvester in very careless hands is its ability to harvest crops in which the grain is immature or otherwise carrying too high a moisture content. When an attempt was made in earlier days to harvest such crops with stripper-type machines, the choking of the comb indicated that the crop was not in condition to harvest, and compelled a cessation of operations. The harvesting of grain in an immature or moist condition does not save time, for the grain must be spread out, dried and rebagged, if total loss is to be avoided. Damp wheat will not be accepted by the Wheat Board's classifiers under any consideration. In addition, wheat which is only slightly moist is far more susceptible to weevil attack than hard, dry, fully matured grain.

1951-52 crop

Australia's wheat crop for the 1951-52 season is now estimated to have totalled about 161.4 million bushels from 10,434,000 acres sown, representing an average yield of 15.47 bushels per acre sown for grain. The 1951-52 crop is somewhat smaller than the exceptionally good harvests of the four previous seasons, but exceeds the average production for the ten seasons ended 1950-51, 115.8 million bushels. Moreover, although the estimated Australian production of 161.4 million bushels in 1951-52 shows a decline of 58.5 million bushels (26.7%) from the record harvest of 1947-48 and is the lowest production since the drought year 1946-47 (117.3 million bushels), it is 7.0 million bushels (4.6%) above average production for the five years ended 1938-39. Wheat production in 1951-52 was lower than in the previous year for all the principal producing States.

The estimated area sown to wheat in 1951-52 (10,434,000 acres) is the lowest for any peace-time season since 1925-26,

and is 2,546,000 acres (19.6%) less than average sowings for the five seasons ended 1938-39. The decline in area occurred in all States except Western Australia, where the area sown in 1951-52 (3,200,000 acres) is the highest since 1938-39 (3,413,000 acres). The South Australian area sown to wheat in 1951-52 is the lowest since 1897-98.

The Australian average yield of 15.47 bushels per acre in 1951-52 is good, although 4.3% less than the mean of average yields during the four seasons ended 1950-51 (16.16 bushels per acre) when excellent seasonal conditions were experienced throughout most of the wheat areas of the Commonwealth. The 1951-52 average yield per acre, however, exceeded the average yield for the five seasons ended 1938-39 (11.89 bushels per acre) by 3.58 bushels (30.1%); as a result, total production of wheat in 1951-52 exceeded average production for the seasons 1934-35 to 1938-39 by 4.6%, notwithstanding the substantial decline of 19.6% in acreage sown. The 1951-52 average yields per acre were higher than in the previous year in New South Wales, Queensland, South Australia and Tasmania. The South Australian yield of 17.81 bushels per acre has been exceeded in that State only in 1942-43 when 18.18 bushels per acre were recorded.

Marketing

At the outbreak of war in 1939, all wheat grown in Australia was subject to acquisition under the National Security (Wheat Acquisition) Regulations. Under these Regulations the Australian Wheat Board became the prime authority for the marketing of wheat in Australia. Under the Wheat Industry Stabilisation Scheme which was introduced in the 1947-48 season, some State Wheat Boards have been preserved as a separate entity and work in conjunction with the Australian Wheat Board, so that the industry is now organised on a national as well as a State basis. This scheme provides for guaranteed returns to growers until the 1952-53 season.

Further progress towards the stabilisation of the wheat industry has been accomplished with the operation of an international wheat agreement which now provides a measure of stability in the export market.

Present trends

In recent years the shortage of bags which were once obtainable at a shilling each and which now, when available, cost as much as seven shillings each, has led to the extensive practice of bulk handling of wheat. The wheat is conveyed in bulk direct from the farm to the bulkhead at the railway station. From there it is conveyed by closed-in trucks to the subterminal at seaboard, where intended for export, or to mills where for local consumption. These bulkheads are at present constructed of timber and are of a semi-permanent nature until such time as more durable materials can be procured.

A change-over from wheat growing to fat lamb raising has taken place in Australia in recent years. Growers maintain this is due to the unsatisfactory return they received for their crop, the unrealistic approach of the Australian Commonwealth Government to their problems, and the crippling taxation burden they are called upon to bear.

The accompanying table shows how the number of farms carrying 20 acres and over of wheat has decreased over the past 12 years.

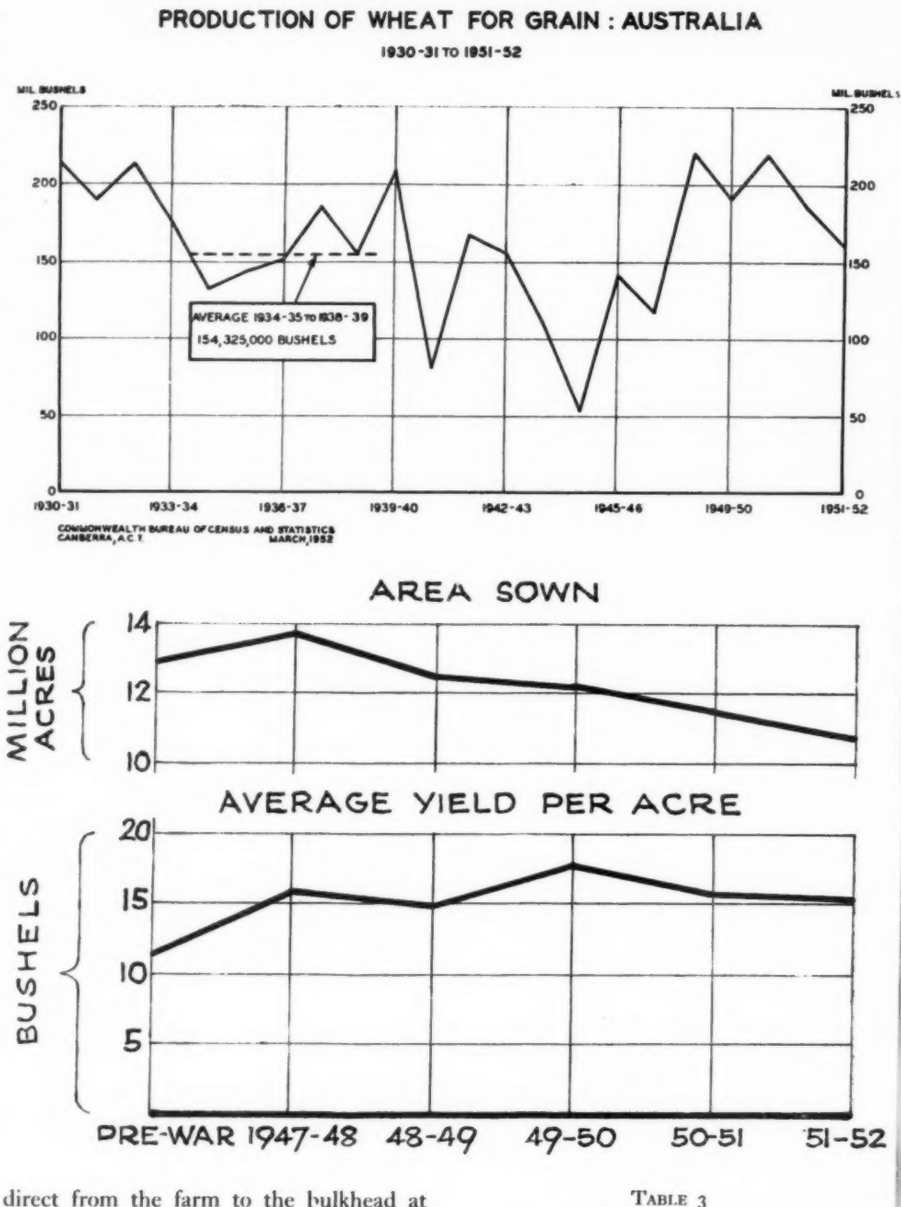
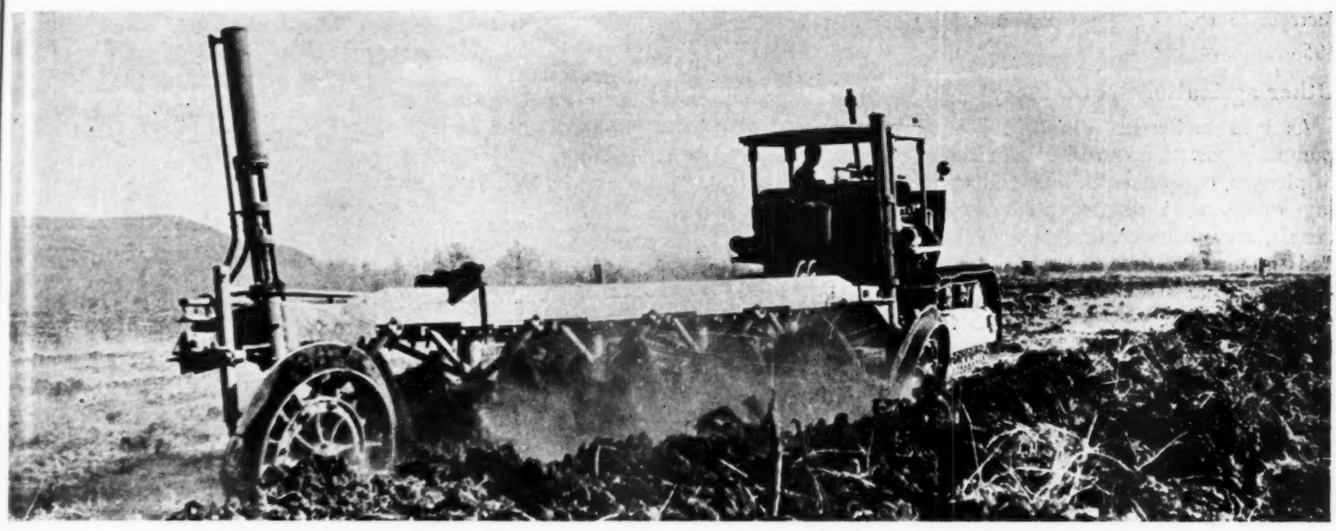


TABLE 3

NUMBER OF FARMS GROWING 20 ACRES OR MORE OF WHEAT FOR GRAIN IN AUSTRALIA

State	*Pre-war* 1938-39	1950-51
New South Wales ..	16,550	14,279
Victoria	12,305	11,203
Queensland	3,190	3,862
South Australia ..	11,842	8,416
Western Australia ..	8,989	7,814
Tasmania	146	79
	53,022	45,653

But for all that the future of the Australian wheat crop is far from gloomy. Many problems are confronting wheat growers, but ways and means of overcoming all of these will surely be found in order to maintain Australia's position as fourth on the list of the world s principal exporters of wheat.



A tractor of India's Central Tractor Organisation pulling a Towner giant disc plough through previously cleared jungle land near Bhopal

The Mechanisation of Agriculture in India

J. GRINDROD, B.A. (Com.)

THE present and future development of the mechanisation of Indian agriculture presents rather a complex problem and is essentially bound up with the development of the country as a whole, since, before the war, about nine-tenths of its vast population depended on agricultural pursuits for their existence.

Mechanisation of Indian agriculture includes the provision of irrigation facilities, *i.e.* the carrying out of large-scale projects and of small local schemes involving the installation of diesel engines and power-driven pumps of various sizes, etc.; the provision of a wide range of machinery, some home produced, some imported; the overcoming of shortages of materials, particularly iron and steel; the education of agriculturalists in the use of modern implements and machinery and getting rid of their inherent prejudice against them, and, of course, the adoption of implements and machinery suitable to local conditions especially as regards soils, small holdings, etc. Arising out of this mechanisation, also, is the possibility of the unemployment of redundant agricultural workers.

India has a total area of 781 million acres, of which 370 million acres are cultivable and 250 million acres yet remain to be classified. The total area cultivated every year is put at 236 million acres. For want of irrigation facilities large areas in various parts of the country are lying as uncultivable wastes, while existing cultivation in many areas produces but poor and precarious crops.

Irrigation

In spite of the considerable sums already invested in various irrigation schemes only 50 million acres are provided with irrigation, and this represents only 13.5% of the cultivable land and 21% of the land actually under cultivation.

ADDITIONAL FOOD EXPECTATIONS FROM INDIA'S MAJOR IRRIGATION SCHEMES

Year	*Irrigation (1,000 acres)*	*Additional food (million tons—based on present standard of agriculture)*	*Power (1,000 kW.)*
1951-52	647	0.2	—
1952-53	1,114	0.4	351
1953-54	1,997	0.7	554
1954-55	4,315	1.4	596
1955-56	5,499	1.8	636
1956-57	6,685	2.2	708
1957-58	7,502	2.5	791
1958-59	8,527	2.8	817
1959-60	9,190	3.1	910
Ultimately	12,949	4.3	1,996

Vast projects are in hand based on the storage of water available during the rainy season. Multi-purpose schemes are being prepared to provide irrigation, hydro-electric power, flood control, navigation, soil conservation, etc.

At present eight multi-purpose schemes, one major irrigation scheme, three power schemes, each costing over Rs. 10 crores, 24 schemes each costing between Rs. 2 crores and Rs. 10 crores, and 99 schemes each costing less than Rs. 2 crores are under actual construction. The total estimated cost of the 12 major schemes is Rs. 438 crores.

It is expected that the completion of these projects will progressively add to the irrigation, food and hydro-electric power as shown in the accompanying table.

Including schemes not yet started, the total estimated cost of irrigation projects is about Rs. 1,900 crores. All these works, if and when completed, will add over 42 million acres to India's existing 50 million acres of irrigated areas and about 11 million kW. of hydro-electric energy to the existing meagre half-million kW. In addition, too, they will call for a greatly increased supply of agricultural implements and machinery of all kinds.

Pump manufacture

The manufacture of power-driven water pumps is undertaken by eight organised units in India. Importation is not allowed at present. The annual installed capacity of these units together equals about 33,000 pumps of varying sizes. Also, there are five concerns engaged in the manufacture of diesel engines with potential annual output of 5,300 machines of different horse-powers. The number of power-driven pumps actually produced during 1949-50 was about 31,000 and that of diesel engines 4,600. In addition, the import of diesel engines during 1949-50 formed 50% of the value of total imports of agricultural machinery, which, in 1949-50, was valued at Rs. 165 millions.

The requirements of diesel engines for irrigation purposes have been estimated at 30,000 per annum while present Indian capacity is 5,300 as stated. It is planned to expand the output of existing firms and, in addition, four new firms have been allowed to set up plants for manufacturing diesel engines. If all this materialises it is expected that the installed capacity will

increase to 17,600 engines per annum by 1952.

Other agricultural machinery

As well as Persian wheels and water pumps, importation into India is forbidden of ploughs, cultivators, drilling and planting machines, threshing machines, oil ghanis, sugar-cane crushers, chaff cutters and groundnut decorticators. Simple types of implements are, of course, made in many village workshops, but apart from these, improved types of these implements are at present manufactured in 231 factories with a rated capacity of 40,000 to 50,000 tons of steel consumption on single-shift working.

Imported machinery consists chiefly of pumping machinery, diesel engines, tractors and parts. Pre-war, the average annual importation came to Rs. 10 million. Since the war there has been a steady increase, the total amounting to Rs. 90 million in 1948-49 and Rs. 165 million in 1949-50.

The Indian Ministry of Food and Agriculture has estimated that the need for agricultural tractors during the next few years, plus the annual demand for tractors for other purposes, will increase to 10,000-15,000. The Government of Orissa has proposed a scheme for setting up a large plant for the manufacture of tractors with a capacity of 15,000 tractors per annum. If this could be carried out India would become self-sufficient in this respect.

At present the bulk of the tractors used in India are imported and in 1949-50 tractors and tractor-parts accounted for 31% of the total of agricultural machinery imported, the actual number of tractors imported being estimated at 4,000 to 5,000.

Plans for the future

The importance of the development of the use of agricultural implements and machinery in India has been officially recognised. In April 1951 the use of machinery to meet the growing needs of agriculture was considered by a Planning Commission set up to study for a five-year plan. At this industrial development meeting the Commission discussed many aspects of mechanisation with representatives of industry. The need was mentioned for co-ordinating the manufacture of implements and machinery with the agricultural requirements in different regions according to soil conditions, the size of holdings and the economic status of the farmer himself. It was recognised, for instance, that the scope for the development of tractor manufacture was limited because of the small size of agricultural holdings, the possibility of tractors creating unemployment of farm labour and the absence of a well-developed car manufacturing industry with which the manufacture of tractors is usually closely linked.

Caterpillar D4 with bulldozer, used for clearing palm trees from a plot to be used as a seedbed (photo taken in Mysore)

At the meeting it was suggested that a survey should be undertaken by a small team consisting of an agronomist, a soil physicist, agricultural engineers and a representative of agricultural industry to determine the types of implement best suited to different soils and different conditions.

It was recognised that the shortage of iron and steel stood in the way of large-scale production of improved types of machinery and as there is also a difficulty in finding the necessary finance for starting large steel plants, it was suggested that some steel processing industries might jointly sponsor the setting up of a blast-furnace plant.

The importance of manufacturing spares for tractors was also recognised as well as the need for facilities for servicing and keeping existing tractors in a good state of repair.

It was proposed that a Central Organisation with regional agencies should be set up in order to make available to agriculturalists and land workers the results of research into the use of improved implements and tools.

Photos: Caterpillar Tractor Co.

Coconut Survey Carried Out by South Pacific Commission

Vigorous measures to restore and expand the coconut industry in Fiji, Western Samoa, American Samoa and the Lower Cook Islands are being taken by the authorities there, according to Mr. W. V. D. Pieris, copra specialist to the South Pacific Commission, who has just returned to Commission headquarters at Noumea after a two months' tour of the territories named.

'In the South Pacific, coconut yield from plantations and village holdings is steadily declining,' said Mr. Pieris. 'At the same time the populations of most territories are increasing, and as coconuts are their main source of food and income, the problem is a serious one.'

Mr. Pieris said that the main reason why coconut yields are declining is that most of the plantations in the Pacific are well over 60 years old. The palms are approaching senility, making decreased output inevitable.

Other contributing factors are the presence of dangerous pests in certain areas and the general uncertainty in the minds of growers with regard to the future of the industry.

'The gravity of the problem is fully understood by administrative and agricultural officers of the four territories I visited,' said Mr. Pieris. 'In Fiji and Western Samoa, for instance, rehabilitation campaigns have been started already, and similar campaigns are to be inaugurated shortly in American Samoa and the Cook Islands. The improvement of the quality of copra is also receiving attention.'

Agriculture in Papua and New Guinea

WITH an area of 183,000 square miles, of which about 27,000 square miles is cultivable, the territory of Papua and New Guinea offers considerable scope for agricultural development, says the Australian Department of Territories. The climate, particularly the rainfall, over so wide an area naturally presents many variations. Generally speaking, however, the climate is moist and tropical, except at high altitudes. The territory has no winter and summer, the two seasons which are experienced being described as 'south-east' and 'north-west,' corresponding with the periods of the year when the south-east trade winds and the north-west monsoons direct the main territory airflow. The south-east season prevails approximately from May to October, while the north-west monsoon operates over a considerably shorter period, between December and March.

Soils and crops

Although a large portion of the territory is covered by skeletal soils unsuitable for agriculture, there are extensive areas in all parts suitable for growing a wide range of crops. Volcanic soils, mainly found on the central plateau and southern foothills, probably offer the greatest prospects for development. Other rich soils are the alluvials of the river valleys.

Crops which can be grown in Papua and New Guinea include copra, rubber, tea, jute, coffee, cocoa, pepper, rice, sisal, kenaf, manila hemp, tobacco, peanuts, nutmeg, vanilla, cassava, ginger, cinchona, tropical fuits and vegetables, and sago.

Given that soils and climate are suitable, the first essential for agricultural settlement is, of course, suitable land. Only about 2% of the total land area of the territory has been alienated. Conditions of agricultural and pastoral leases in Papua and New Guinea are liberal, with the term of an agricultural lease open to any period not exceeding 99 years. Terms of pastoral leases may be any period not exceeding 99 years in Papua and not exceeding 30 years in New Guinea.

Agricultural settlement

Another important factor in agricultural settlement in New Guinea and Papua is that of native labour. Territory natives have been found suitable as workers in a wide variety of occupations and there seems to be no reason why they could not adapt themselves even to the more specialised aspects such as tea growing. Of the 1,500,000 natives in the territory, only about 52,700 are in employment. Natives may be employed as casual workers or under agreement. The term of an agreement may not exceed 18 months, but it may be extended up to two years. Employers must pay a minimum wage of 15s. per month, supply employees with rations, housing, clothing and essential articles such as blankets, mosquito nets and cooking utensils, and provide medical attention. In addition, the employer must pay the cost of transporting the native to his place of employment, and also of returning him to his home at the end of the agreement. Cost of employing a native labourer is estimated at being about £100 per annum at present.

Native tappers on a Koitaki rubber plantation, near Port Moresby, bringing in latex to the factory

Part of the Garaine Tea Project in the Waria Valley, New Guinea, 2,700 ft. altitude. Crotaleria shade trees have been planted between the rows of tea bushes

The Commonwealth Government is encouraging European private enterprise to develop the agricultural resources of Papua and New Guinea by causing suitable accessible land to be made available, and by providing technical advice and making planting material available where ever practicable.

Rice cultivation

Recently attention has been directed to the possibilities of rice cultivation in the territory, and on behalf of the Commonwealth Government a rice expert, Mr. W. Poggendorf, of the New South Wales Department of Agriculture, toured the territory during 1952 and reported to Government. His report showed that although at present all the rice produced in New Guinea is of the upland type and grown under upland conditions, the flooded cultivation of wet rice should become the major method of rice production on the extensive lowlying areas. The report envisages aerial sowing and weed control of extensive rice fields in New Guinea following the pattern adopted in the U.S.A.

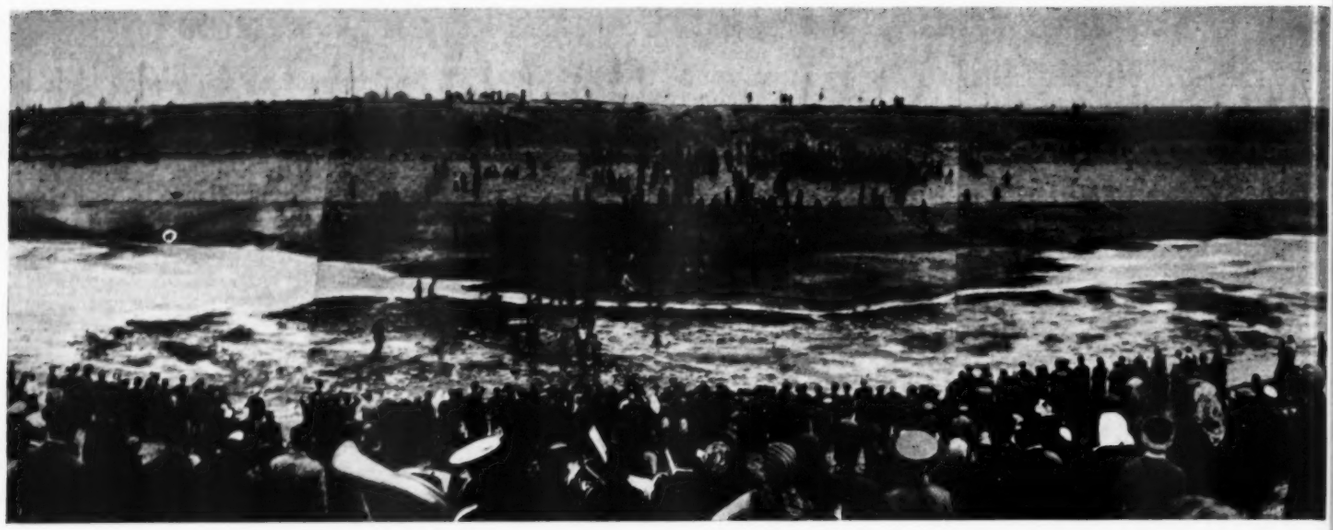
At present the territory imports some 15,000 tons of rice annually from Australia, but it is undoubtedly capable of producing all the rice it needs and becoming a major exporting country; large-scale mechanisation, coupled eventually with aerial sowing and weed control, are considered to be the only possible methods of development.

Photos: Australian News and Information Bureau.

Technical News

In *Food Manufacture*, one of our sister journals, an article on 'Transport and the Food Industry,' by C. R. Saville Smith, appears this month. 'World Chemical Expansion' is the title of one of the feature articles in *Chemical and Process Engineering*, while *Manufacturing Chemist* contains this month its well-known feature 'Progress Reports on Fertilisers.'

In *Muck Shifter and Public Works Digest* an article by Link van Bruggen will be published, entitled the 'Reclamation of the Zuiderzee.'



An historic moment. The waters of the Volga (*left*) meet the waters of the Don on May 31 at the section of the canal between the first and second sluices

The Volga-Don Irrigation Project

The ship canal between the Volga and Don Rivers, which was formally opened on July 27, 1952, is more than a link in the waterways of the Union of Soviet Socialist Republics. It is also a part of the large network of irrigation canals that is being constructed for the arid and semiarid regions of the Stalingrad and Rostov Provinces. This year, reports say, enough of the network has been completed to irrigate some of the cropland in the Rostov Province along the lower Don River. Until now, all irrigated agriculture in the U.S.S.R., with certain minor exceptions, has existed only in the cotton-growing regions of Central Asia and Transcaucasia. The following article, which was prepared by the Regional Investigations Branch of the U.S. Department of Agriculture's Office of Foreign Relations, describes some of the construction work that has been done on this project and the crop increases that are anticipated as a result.

THE Volga-Don irrigation network is one of the 'Great Construction Projects of Communism' announced and acclaimed throughout the Soviet Union in the latter part of 1950. These projects include two huge hydro-electric stations at Kuibyshev and Stalingrad on the Volga River, a 650-mile irrigation canal from the Amu Darya River to the Caspian Sea in Western Turkmenistan, and a 300-mile irrigation canal from Zaporozhe on the Dnepr River in Southern Ukraine to Kerch in the Crimea—all with their accompanying irrigation systems.

All of these projects are scheduled for completion before or during 1957. Together, they are to irrigate nearly 15,000,000 arid and semi-arid acres throughout the U.S.S.R. In addition, they will be supplemented by 'water-conservancy' programmes, which will benefit 55 million acres more. Included in these programmes will be wells, ponds and basins built to take advantage of seasonal precipitation, various means of utilising the seepage from irrigation systems and the overflow from all types of reservoirs; these are expected to maintain pasture and support the growth of wild hay.

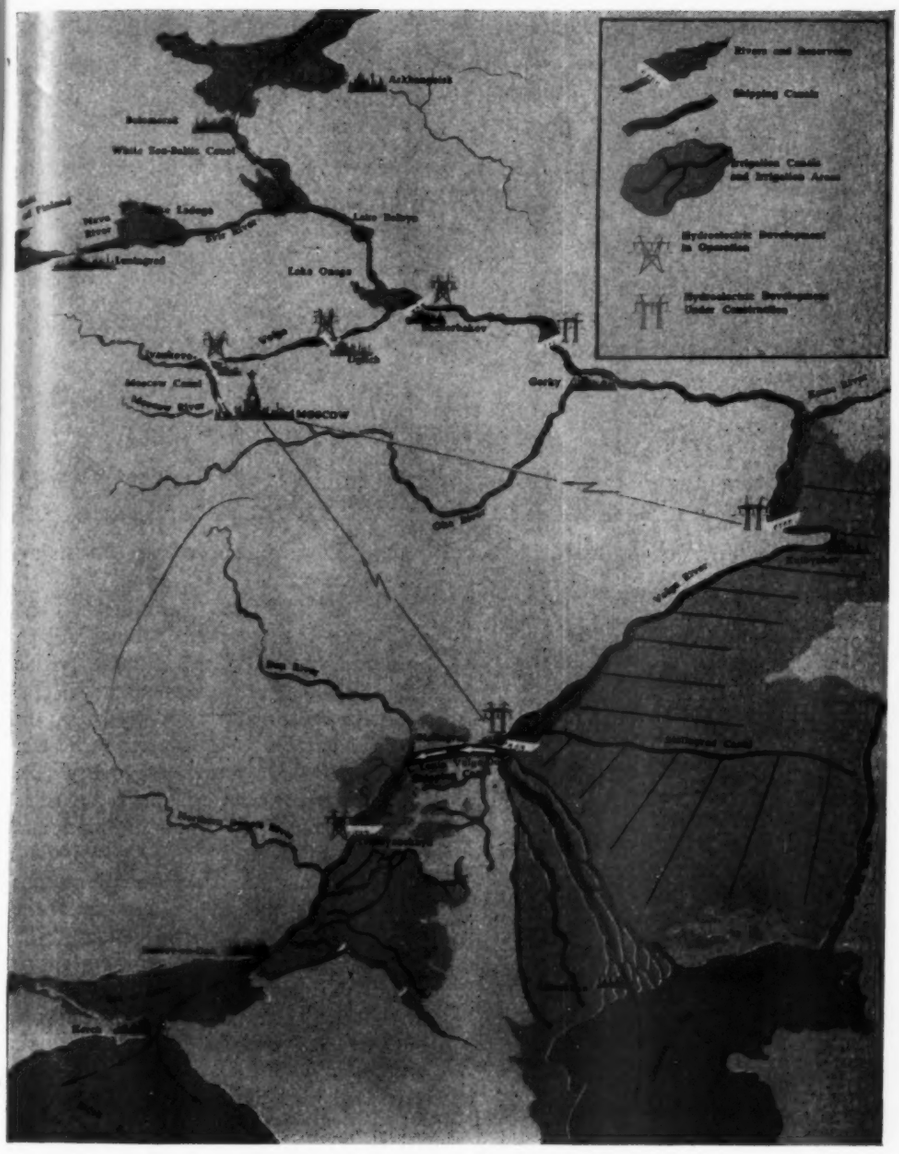
Progress of work

The Volga-Don irrigation project, first in the series to be partly completed, has as its final goal the irrigation of 1,850,000 acres in the Rostov and Stalingrad Provinces. In addition, 5,000,000 acres are expected to benefit from a supplementary system of water conservancy.

Parts of the system finished to date are the Volga-Don ship canal; the Tsimlyansk Reservoir; and 120 miles of major irrigation canals. These last are a section of the main Don canal, from the Tsimlyansk Reservoir to the point of the projected tunnel under the Sal River, and two distribution canals—the Lower Don canal extending westward from the Don main canal along the Don River, and the Azov canal extending westward from the Manych River reservoir to the Sea of Azov. It is reported that thus far 1,665 miles of irrigations canals have been completed in the project; presumably these figures include all channels, large and small. Still uncompleted are the greater part of the Don main canal (all the sections extending southward from the tunnel) and five distribution canals. Most of the area to be irrigated by the system must wait upon the completion of these canals. All in all, the finished project will include 470 miles of major irrigation canals, 140 pumping stations and five hydro-electric stations.

Volga-Don ship canal

Construction of the Volga-Don ship canal has been on the minds of Soviet planners for a long time, and work was actually begun on it before World War II. Progress halted during the war with the heavy military operations around Rostov and Stalingrad, and presumably renewal of



Russia's inland water system now connects five seas together

the project was delayed by post-war reconstruction in the area. In December 1950 the canal was once more announced as a construction project, this time with irrigation facilities added. The year set for completing the canal was 1952; for the entire project, 1956.

The ship canal joins the two great rivers of European Russia. Thus it unites the seas of the country into one waterway, connecting the Baltic and White Seas in the north and the Caspian Sea in the south with the Sea of Azov and the Black Sea, and opens the Volga system into the Mediterranean. It is the final link in the huge system that began with the canal between the White and Baltic Seas in 1933 and the Moscow Canal in 1937.

It extends 63 miles in an S-curve from Stalingrad on the Volga to Kalach on the Don. To cross the divide between the two rivers, which is 144 ft. above the Don and 289 ft. above the Volga, 13 locks were necessary—nine on the Volga side and four on the Don side. Three reservoirs were formed from streams in the trace of the canal, so that only 32 miles of channel had to be built.

What proportion of forced labour was used in building the canal is not known, but such labour has predominated in other large construction projects in the U.S.S.R. The Soviet Press, apparently trying to suggest that little or no forced labour was used, has emphasised the considerable use of heavy machinery; it has also portrayed the canal as entirely the product of spontaneous popular action. Some conclusions as to the popularity of the canal, however, may be drawn from the fact that neither Stalin nor any other member of the powerful Politburo attended the official opening of the canal, which is named after Lenin.

Tsimlyansk Reservoir

The Tsimlyansk Reservoir, or 'sea,' as the Russians term it, was built in order to maintain the navigability of the Don River between Rostov and the ship canal. The reservoir, which is about 90 miles long and 24 miles wide at its widest part, was formed by building an earth-filled dam in the Don River at Tsimlyanskaya, about 90 miles below the canal. The dam itself is about seven miles long, 105 ft. high, and wide enough to accommodate a railroad and a paved highway; its northern end is a hydraulic dam of reinforced concrete 540 yds. long, which includes a fish ladder and two locks. It is claimed that ships can complete passage through these locks in 12 to 18 minutes.

To clear the more than 700 square miles required for the Tsimlyansk Reservoir it was necessary to move 49 communities in the Rostov Province. In the Stalingrad Province, transfers involved two towns, more than 9,000 peasant homes, as well as the property of 71 collective farms, six machine tractor stations and 727 public buildings.

Water from the Tsimlyansk Reservoir will be used to irrigate the semi-arid steppe lying south of the Don River, including the valleys of the Sal and Manych Rivers, as well as some of the area in the Stalingrad Province. In addition, the large hydro-electric station, which has a power capacity of 160,000 kilowatts and a planned annual output of 500,000,000 kilowatt hours, will provide electric power for agriculture and industry; it will be augmented by several smaller stations in the region. In this connection it should be mentioned that one feature of the Volga-Don irrigation project is the emphasis on electro-machine-tractor stations. Two organisations of this new type have already been set up, and the plans call for many more as power from new hydro-electric stations becomes available. Through the assistance of these stations, it is said, farm operations like ploughing, drilling, cultivating of fallow and row crops, stubble mulching and harvesting are to be performed with electric tractors or electrically powered machinery.

Irrigation expectations

Of the area that will benefit from the irrigation and water conservancy facilities of the Volga-Don project, most will lie within the Province of Rostov. Final goals specify that 1,480,000 acres will be irrigated in that Province compared with 370,000 acres in the Stalingrad Province. Of the total in the Rostov area, only about one-third will be irrigated by gravity flow; the rest will require mechanical lift. To execute this enormous task, the plan calls

for 80 pumping stations. Already seven of them, with a total of 22 pumps, have been constructed. In the Stalingrad area 264,000 of the irrigated acres will receive water from the Tsimlyansk Reservoir and the rest will be supplied from the Volga-Don ship canal. With what canals have already been completed, 250,000 acres are said to be under irrigation in the Rostov area this year. In 1953 it is expected that 250,000 more acres will be brought under irrigation in that Province and 60,000 in the Stalingrad Province. Only time will tell whether the goal of 1,850,000 irrigated acres is to be attained.

As far as the supplementary water-conservancy projects are concerned, 250,000 acres in the Rostov Province are reported to be already enjoying the benefits of them. Next year the goal is 620,000 acres in the two Provinces together, all but 125,000 of them in the Rostov Province.

Most of the area to be irrigated in the two Provinces is part of the steppe between the Azov and the Caspian Seas, a semi-arid region of low precipitation and frequent droughts, relatively flat, all of it less than 500 ft. above sea level. Average weather observations for the area are available only for the two major cities, but these probably represent the range of conditions well enough. The growing season is short, extending from the middle of April to the middle of October; at Stalingrad it lasts 177 days; at Rostov, 184. Annual precipitation is 14.6 in. at Stalingrad; 18.5 at Rostov. Temperature during the warmest month is 76.5° F. at Stalingrad and 75° at Rostov; during the coldest month, 14° at Stalingrad and 21° at Rostov.

An 'electric' tractor at work on a collective farm in the cotton-producing Republic of Usbekistan

Crops and yields

As a result of these poor growing conditions, crop yields in the area have been consistently low. The predominant crop is spring wheat, followed by winter rye and winter wheat. In 1928-32 the officially reported average yield of spring wheat for the Lower Volga territory, which then included the present Stalingrad Province, was only 7.6 bushels per acre; for the North Caucasus territory, which included the present Rostov Province, it was 8.6 bushels. In 1933-37 reported yields were somewhat higher—7.9 bushels in the Stalingrad Province and 9 to 10 in the Rostov Province—but the increase was probably due to the fact that in 1933 the Soviet authorities ceased to report crop production in barn yields and began instead to report it in biological yields—*i.e.*, as estimated yields in the field before harvest—a practice that results in figures 10% to 20% higher. In 1931 the average yield of spring wheat in the Lower Volga territory was less than five bushels per acre, and yields almost as low were reported again in 1932 and 1936.

For both climatic and economic reasons it seems likely that the greater part of the area affected by the new irrigation project will be designated for growing spring wheat. Not only is that crop well adapted to the conditions prevailing in the area, but increased production of bread grains is vital to the U.S.S.R.

Official goals for grain yields in various regions of the Soviet Union were recently announced for the 1951-55 Five-Year Plan. Goals for the Stalingrad region for irrigated wheat were stated as 39 to 43 bushels per acre; for the Rostov region as 45 to 50.

No doubt irrigation will substantially increase yields and stabilise production of wheat and other crops in the semi-arid regions of the U.S.S.R. Fokeyev, in *Sovietskaya Agronomiya* for March 1951, reports that the *sukhovei*, or hot dry winds from the desert, which often play havoc with the crops, do not have such harmful effects on irrigated wheat. Another factor that will contribute to increased yields is the introduction of new wheat varieties not subject to lodging. Nevertheless, the very high goals sometimes cited in Soviet sources appear to be unrealistic. Besides, much will depend on farming and irrigation practices, and past experience of the Soviet Union suggests caution in assuming that these practices will be generally efficient. (From *Foreign Agriculture*)

Some of the two million young trees which are to be planted along the banks of the Volga-Don canal being set in position

Aerial view of the engineering shops and administrative offices of Pest Control Ltd. at Bourn — once an operational airfield

INDUSTRY'S CONTRIBUTION TO AGRICULTURAL RESEARCH—XIII

Pest Control Ltd. in Britain

Part I

W. E. RIPPER, Ph.D., F.R.E.S.

Managing Director, Pest Control Ltd.

This article by Dr. W. E. Ripper describes the work and organisation of Pest Control Ltd. The article is in two parts, that given below dealing generally with various aspects of the work carried out in this country. In the second part, which will appear next month, the work of the overseas companies will be described.

APPLIED science has given an enormous stimulus to modern farming and is the main hope for increasing the productivity of our land to enable us to grow all the food which we need. Though the farmer does not operate his own research unit, he has learned to draw upon research and by so doing the British farmer has become one of the most efficient in the world. He has at his disposal the advice of the National Agricultural Advisory Service as well as the many experimental stations and research institutes operated, or in part supported, by the Agricultural Research Council and the Ministry of Agriculture, while growers' associations and some large agricultural undertakings operate their own research schemes to study specific problems. Many firms that sell agricultural machinery or insecticides and weedkillers are also backed by large and costly research organisations, some of which have been described in this series of articles.

The old way of industrial research was to work secretly in an attempt to find a new product or new process. Nowadays, industry endeavours to help the customer to solve some of his problems. In agriculture farmers have learned that the supply of chemicals, unaccompanied by sound technical advice as to their employment, is often of little value.

But in the field of the eradication of insect pests, virus, fungus and bacterial diseases and the suppression of weeds, advice often needs to be backed by willingness to take responsibility for the treatment recommended. The doctor or veterinary surgeon does not merely advise, he applies treatment and takes the responsibility for it. He is in a contractual and fiduciary relationship to his patient. More than that: it is because doctors 'see through' hundreds of cases from first symptoms to final cure that they have learned the aetiology of diseases, and continue to make contributions to the progress of medical science.

The same principle applies in the field of plant health; it is necessary to follow through thousands of cases to realise all the implications of a treatment and its consequences for the crop and the living organism associated with it. The official advisory officer or research worker is seldom in a position to do this; and consequently there is need for a specialist organisation, which can bring modern discoveries on to the farm and follow the treatment under all sorts of circumstances.

From its inception Pest Control Ltd. has been organised to provide this type of service. They not only supply chemicals with instructions, advice and demonstrations in their use, they also diagnose problems, take out sprayers and chemicals to the field and apply the proposed treatment on the farm, standing to be judged by the result.

A team of specialists

To do this, Pest Control have built up an organisation which straddles the frontiers of farming, industry and applied science. Governments, of course, frequently undertake pest control campaigns; but study of the problem of putting applied entomology at the service of the farmer convinced Sir Guy Marshall, then director of the Imperial Institute of Entomology, during the 'thirties, that the hope and possibilities of Government action were limited. The State can finance basic research, frame legislation, and, in national emergencies when pests such as Colorado beetles or locusts threaten to cause

immense losses, step in and create national or even international defence organisations.

But most pest problems require an organisation which is in close and constant touch with changing crop and farming conditions, which can bring the latest advances of science and technology to bear on all problems and operates throughout under practical farm conditions. Moreover, the organisation must be able to answer the farmer's inevitable question, 'Will the treatment pay for itself?' This has been done by applying the treatments to the farmer's own fields on a contract basis.

Such a programme demands new tools and new chemical products, and from the start Pest Control Ltd. has undertaken both the manufacture of chemicals and spraying machinery as well as the use of these in the contract service; they are, indeed, still the only firm which performs this multiple function. It was only by designing machines and chemicals to suit one another that they could hope to meet farmers' demands that, however far into academic fields research might lead us, on the farms the treatments must be practical, economical and fit in with other farm operations under all conditions. Further, the objective must always be to simplify and improve a new treatment, once all its aspects and working conditions are understood, so that what at the start was a specialist job may—in as many cases as possible—become a part of farm routine and be handled by unqualified workers.

Working in this way, just as industry subcontracts much of its research to organisations equipped to bring the *whole* resources of applied science to bear on a *single* problem, Pest Control Ltd. has built an organisation capable of bringing the whole resources of applied biology to bear on a single pest of a single crop.

Wide range of research

Applied research of this nature usually involves breaking down a complex problem into its elements, for study by a team. The biologists study its bionomics and ecology, and make tests with existing insecticides and weedkillers. They also work out the part played by beneficial insects. The chemists are concerned with syntheses of new compounds to widen the range of chemical weapons; they are also concerned with the practicalities and economies of industrial production. The physicist is concerned with methods of application, and the medical research unit is concerned with the safety, toxic residues and other aspects of the toxicology of the material.

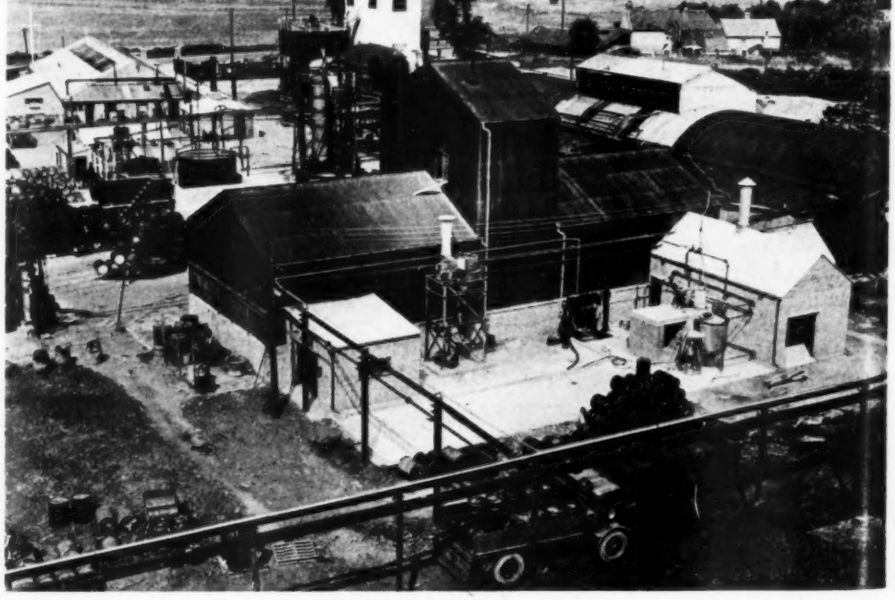
For example, at one and the same time Pest Control laboratories are interested in the chemistry of simple wetting agents and of highly complex phosphorous compounds; of radio tracer techniques to observe the movements of chemicals in plants, chromatography and other modern analytical techniques; the aerodynamics of helicopter flight close to the ground and the mechanical problems of applying sprays; the metallurgy of spraying gears to prevent corrosion of sprayers, chemical plant and containers; the toxicology of insecticides to mammals and birds; the ecology of insects and the epidemiology of their population changes; the physiology of plant growth and plant nutrition; the meteorological background of pest and disease outbreaks—these are only some of the many spheres of scientific knowledge in which the organisation moves. It has rapidly grown by reason of the heavy demand for its services and, while it was sometimes difficult to find sufficient numbers of qualified workers to staff all research projects on hand, good progress has now been made in training and recruiting staff. The movement of 24 biologists and 8 biochemists to Pest Control's new research centre at Chesterford Park is shortly anticipated, while chemical and industrial research will remain at their chemical factory at Harston and engineering research at their engineering shops at Bourn. In addition, they maintain a number of field stations in this country and overseas.

Biological approach

It is no accident that the name of Pest Control has become associated with the development of systemic insecticides. From the first, the approach to standard practice in pest control has been constructively critical. Long before the introduction of such powerful insecticides as DDT, entomologists had established that insects, as well as fungi, were capable of developing resistance to chemical controls. Such resistance is inherited and possibly sex-linked; there is therefore a man-directed evolution of indestructible pests. Early cases in point are the red scale (*Aonidiella aurantii* Mask.) which developed resistance to hydrocyanic acid, and the codling moth which developed resistance to lead arsenate, so that, in a few years the indiscriminate use of spraying methods turned a paying technique into one that permanently raised production costs. Many other insects became resistant to spray chemicals. It is well known that over a large part of the world flies are DDT resistant and red spiders have become resistant to parathion. Last year it was shown in America that the caterpillar of the cabbage white butterfly has become DDT resistant and in Long Island Colorado beetle seems to have developed resistance to DDT.

Selectivity and systemic insecticides

A biological approach to insecticides must reckon with these contingencies, and seek to provide a solution which works *with* rather than *against* nature. Their object was accordingly to reinforce, not to supersede, biological control. They first introduced a successful selective chemical treatment of cabbage aphis (*Brevicoryne*



General view of the chemical works at Harston

Dr. Ripper (*left*) with Mr. Lickerish in the experimental laboratory

brassicae L.) by nicotine gassing, based on the difference in toxicity of nicotine vapour to aphids and their parasites and predators. It was shown by experiments that whereas the pests built up again rapidly after incomplete kill by the control methods then in use, such as derris and pyrethrum, this did not occur with nicotine vapour because the unharmed parasites and predators quickly destroyed surviving aphids. This demonstration was followed by the successful fumigation of thousands of acres of brassicas for farmers at an economic cost. The drawbacks of nicotine gassing, including the need for favourable weather and the difficulty of manhandling large drag sheets, were well realised, but the practicability of combining chemical and biological control was proved and led to intensive research on systemic insecticides as soon as it was realised that some of them are very selective. This seemed an important point because when dealing with insecticides previously no efforts had been made to prevent the simultaneous extermination of beneficial insects which prey on the pests in large numbers. For example, there can be no doubt that selective chemicals such as systemic insecticides will enable the great wealth of entomological knowledge on parasites and predators to be made use of, resulting in fewer chemical treatments and cheaper crop protection.

Pest Control was the first organisation to make practical use of Schrader's discovery that some organic phosphorous and fluorine compounds are both systemic and insecticidal; Dr. R. M. Greenslade made the discovery that Schradan, which was toxic when imbibed by sucking insects, was relatively harmless to carnivorous insects, *i.e.* the predators; other systemic compounds were shown to possess not only ecological, but also physiological selectivity (some of them even if sprayed on predators and beneficial insects, did not kill them). Under the direction of Dr. G. S. Hartley, the biochemical staff followed the absorption of systemics through the leaves, stems, and roots, measured rates of translocation in different plants and analysed the extent and speed with which the plants broke down these compounds into residues harmless to consumers. The timing of treatments for each crop and the periods which must elapse between the last treatment and harvesting were worked out, and are still being studied for additional crops in all parts of the world. Mr. A. L. Abel arranged with scientific collaborators abroad the investigation of the influence of Schradan on the soil microbes and results have shown that it has no detrimental influence on the soil microbes but produces a significant increase of Azotobacter.

Practical results

Although the practical use of systemic insecticides is relatively new, yet there is already impressive testimony to their potentialities. It is barely six years since Pest Control began to synthesise Schradan and work out its biochemistry and toxicology; it is barely four years since they first introduced Pestox 3 to growers as a control of hop aphis (*Phorodon humuli* Schr.) and red spider (*Tetranychus telarius* L.). On hops it was shown that chemical and biological control could work together to keep a crop pest-free and that treatments could be organised so as to allow harvesting without risk of toxicity to consumers. The full value of the systemic insecticide was shown in dealing with sucking insects hidden in curled leaves and which therefore escaped the effect of contact insecticides. Its property of keeping new growth toxic to insects for several weeks has particularly recommended it for use, especially on fast-growing crops. Pestox 3 (based on Bis (bis dimethylamino phosphonous) anhydride) has been established as a control of red spider (*Oligonychus ulmi* C. L. Koch) on apples, cabbage aphis on sprouts, pea aphis (*Acyrthosiphon pisum* Harris) on peas, and many more sucking pests of food crops with complete safety.

Pestox 3 has the advantage that it is reasonably safe to handle if routine precautions are observed. Whether applied to leaves or absorbed through root systems, it is fully selective and leaves predators unharmed. Isopestox, (Bis monoisopropylamino fluoro phosphine oxide) kills a further range of insects, including white fly and thrips, and is broken down into harmless residues by plant metabolism faster than Pestox 3, so that it can be used to treat crops nearer harvest time; as against this, when sprayed on leaves, it is less selective and kills predators for a short time until absorbed by the foliage. As it is translocated, this disadvantage can be neutralised by skilled spraying. Another systemic first commercially produced by Pest Control is Hanane (Bis dimethyl amino fluoro phosphine oxide), which is also fully selective when applied through the roots and is providing a valuable control of mealybugs on cocoa in the Gold Coast. We thus have three or four systemics in our armoury and many others are now being tested by Pest Control's research organisation.

Control of virus vectors

The use of systemics has opened up the possibility of controlling virus diseases through control of the disease-carrying vector insects. Contact insecticides are less efficacious here, since we often have to deal with very small populations doing damage out of proportion to their numbers. This necessitates extremely high mortalities such as only insecticides which follow the insect into hidden positions can hope to achieve. Pestox 3 has been used effectively to arrest the transmission of the strawberry viruses, Yellow Edge, Crinkle and Mild Crinkle, by giving virtually 100% kills of the strawberry aphis;

by planting from virus-free stock and regular spraying with Pestox 3, strawberry plantations have been established which show prospects of bringing back the long fruiting years which prevailed before the virus became widely established in this country.

Dr. Hull, of Rothamsted Experimental Station, has, in the course of his work on the yellow virus of sugar beet, come to the conclusion that this could be stamped out by breaking the cycle of infection; he has therefore advocated that sugar beet stecklings should be grown in isolation or so controlled by chemicals that at transplanting at least 95% of the stecklings are virus free.

Pest Control's contribution has been to develop systemic insecticides which can be used on sugar beet stecklings, on mangel crops before harvesting and clamping, and also on the commercial sugar beet crop. They have come much nearer to the solution so clearly seen by the Rothamsted scientists, and have shown that yield increases of sugar beet seed beyond expectation are possible by treating the stecklings with systemics and preventing the spread of the virus from the commercial beet to the stecklings.

Apart from virus control, systemic insecticides have also in other cases proved the answer to hitherto unsolved problems, *e.g.* for some root-sucking aphids such as the lettuce root aphids and the primula root aphids, but unfortunately not for phylloxera.

Contact insecticides

Pest Control has not neglected meanwhile to develop the potentialities of contact insecticides, while seeking to minimise their disadvantages by skilled spraying. It was, for example, the first organisation to use a DDT emulsion commercially on carrot fly and the first to kill swede seed weevil to prevent bladder pod. They developed sprays of copper fungicide combined with DDT emulsion to control potato blight and greenfly in a single treatment. The control of pollen beetle (*Meligethes aeneus* F.) perhaps best exemplifies the possibilities of quick large-scale application of entomological methods in wartime. Pollen beetle before the war had become such a serious pest that it had made the growing of brassicas impossible in some areas. Although the beetle succumbs to insecticidal dusts, farmers made no progress against it, as they did not realise the importance of rapid treatment during a critical period. They also lacked equipment to get over the tall crop during the short time interval in which it could be saved. Basing the treatment on the work of Jary and Carpenter at Wye College, Pest Control, using a fleet of special design high clearance tractors and later helicopters, made it possible to grow brassica seed in areas where losses, before the advent of chemical control, had been crippling. Today the country's brassica seed requirement is grown on a far smaller acreage owing to the seed yields having been stabilised at a high level.

Weed control

In 1932 two French workers discovered the use of sodium dinitro ortho cresylate as a herbicide which distinguished between gramineous crops and a wide range of weeds in arable land such as charlock, poppy, cleavers, etc. Pest Control introduced this chemical which was the first synthetic organic weedkiller used in Britain. When France was overrun in 1940 Pest Control arranged for the production of dinitro weedkillers in Britain, having in the meantime evolved a new formulation of dinitro ortho cresol. Towards the end of the war hormone weedkillers came into use. These are cheaper and easier for the farmer to handle, but some weeds are resistant to them, and others require concentrations of the hormone which reduces the crop yield.

Foliar nutrients

Interesting developments that offer great promise are the application of fertilisers as sprays to the foliage, and results that have been obtained indicate that worthwhile economies might be effected in this way. If these promises materialise it will be possible to apply fertiliser to hill or marsh land which is inaccessible to heavy ground machines. Large-scale experiments are needed, however, to determine the correct stage of the crop and the right dosages for each type of grassland, and these are in progress.

Spraying machine research

Little progress could have been made in the application of improved insecticides, fungicides, and weedkillers without the improvement of spraying and dusting machines. Here an organisation which does contract work on farms as well as designing and producing machinery has obvious advantages. In 1939 spraying machines in this country were largely orchard sprayers and potato dusters. Pest Control's contribution to orchard spraying was the introduction of the automatic—in particular, the oscillating—sprayer. For weed spraying, problems relating to filtration methods, design of nozzles and spraybars and maximum swathe width to minimise damage to crops, had to be solved. To safeguard operators' health Pest Control designed an air-conditioned cab for tractors and developed an enclosed covered boom to obviate spray drift which, in windy conditions, may endanger operators' health and neighbouring susceptible crops. They also introduced to agricultural engineering many modern principles of automobile and chemical engineering.

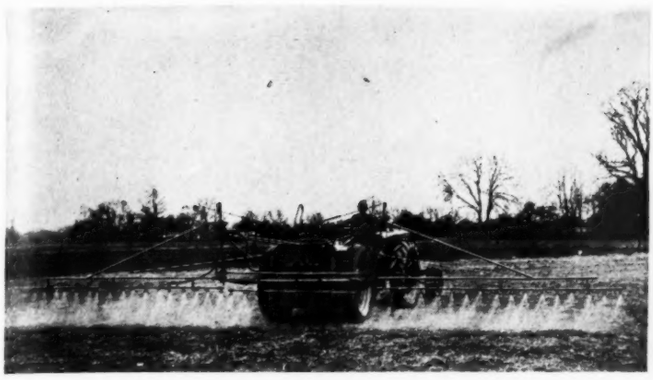
For tall crop spraying they developed the high clearance tractor which allows the wheels to pass on either side of plants. A machine with 4 ft. clearance was developed for brassica, beet seed crops and celery, and another with 7 ft. clearance for cordon fruit trees.

Aeroplane spraying

For tall crops, however, the helicopter is in many respects the ideal spraying machine; swift, efficient and dispensing with wheel marks entirely; it solves difficulties of access and of short headlands for turning, and is independent of ground conditions. The rotors of the 'spraycopter' possess the additional virtue of creating, at certain speeds, a downrush which causes spray to rebound and treat the undersides of leaves. Its use has, however, required the solution of intricate problems in the design of aerial spraygear tanks and pumps. A recent development has been the adaptation of a hydraulic transmission to drive the spray chemical pump. Ideally, a larger machine is needed than the Hillers which are now used, and it will be necessary to await the development of two-rotor hoverplanes which are still in the experimental stage. Spraying machines have been designed for fixed-wing aeroplanes, notably Austers; this is a useful spraying machine for level land and large areas, but it does not, under British conditions, do so good a job as the helicopter. The accident rate of sprayplanes is high, even in flat country such as the cotton belt of the U.S.A. or the Sudan, and in Britain it would be prohibitive. The advantage, technically if not always economically, lies with the helicopter when low flying over hilly or parkland country is necessary.

Preventive medicine

The practice of crop spraying, which has grown in Britain from a few thousand acres in 1939 to 2-3 million acres annually, has created many health problems. Pest Control Ltd. today has a fully equipped medical organisation under the charge of Dr. E. F. Edson, who has specialised in toxicology and industrial medicine. Each branch of the company retains the services of a local doctor who examines operatives weekly in the spraying season, With his report he despatches blood



(*Left*) **a 300-gal. tractor-drawn sprayer at work on a contract job.** (*Right*) **a Hiller helicopter spraying Phenoxylene 30 for control of charlock in corn**

samples to the medical laboratory at headquarters. A rigorous code of health precautions and safety is in operation throughout the company.

In the toxicological laboratory, acute, subacute and chronic toxicity of new pesticides are investigated on suitable experimental animals. Each of Pest Control's systemic insecticides has been investigated in this way before being released commercially. In its application of medical precautions to crop spraying, Pest Control can claim a pioneer role.

Danger to consumers is a smaller risk, since the quantities of poison which can reach any individual would in any case be minute; but no chances whatever can be taken and they have demanded exhaustive experiments on toxic residues.

All new chemicals are for two years used in the contract spraying service only and not released for sale. The estimated harvesting date is taken into consideration before treatment is undertaken and it is part of the contract that the farmer has the crop analysed before harvesting.

All the information on residue analysis is discussed with outside medical authorities, and on such data the limits of safety in the use of toxic chemicals are based, to leave a safety period between the last application of spray and harvesting, called the 'forbidden period'; if these precautions are observed by spraying contractors no risk is run.

Weighing the risk

We should, as a nation, not be justified in refraining from using dangerous spray chemicals simply because there is a risk of misuse. To do that is to condemn huge quantities of food to destruction—to waste hundreds of thousands of acres of land. The object must be to prevent careless handling; to put food first—and make the necessary regulations accordingly. In the Pest Control organisation we believe that this can be done, and that the new chemical insecticides and weedkillers now in use or being developed in research laboratories are vital factors in the fight for that increase in the productivity of Britain's soil which will make Britain's economy stable.

The Value of Californian Redwood

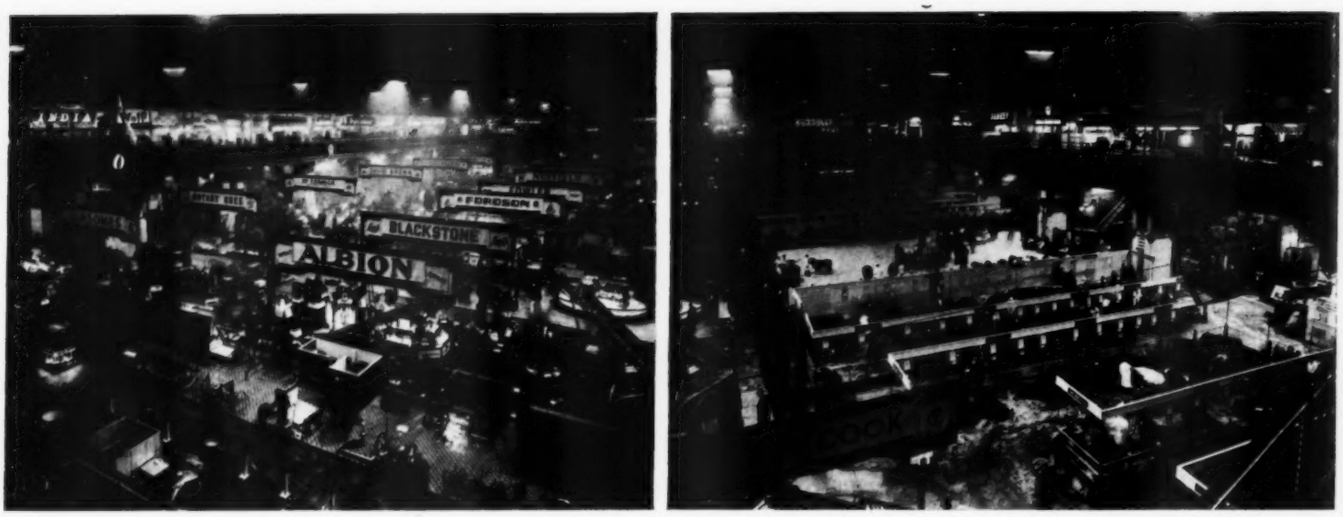
THE Californian redwood, *Sequoia sempervirens*, is famous for the great height to which it grows, the very heavy crops of timber per acre which it has yielded, and the excellent quality of that timber. (The tallest tree in the world is a redwood of 364 ft.; in one part of the virgin forest the standing volume is 150,000 cu. ft.; and logs have been found still sound 1,000 years after their fall.)

An 18-year-old Redwood plantation at Dartington Hall, South Devon. Average height of these trees is 60 ft.

Sequoia sempervirens was introduced into Britain in 1846, but has hitherto been used more in parks, gardens and arboreta than in forestry. Some specimen trees now exceed 125 ft. in height and one or two may have attained 150 ft. In most of the very few places where foresters have tried redwood, it has grown (and is still growing) extremely well. Mr. C. P. Ackers, writing about five years ago, estimated the volume of a famous grove at Leighton in Montgomeryshire at 'nearly 20,000 cu. ft. (true volume) per acre at about 85 years growth.' A small plot established at Dartington in South Devon in 1934 now has a mean height of over 60 ft. (one or two individual trees have topped the 70-ft. mark) and annual increment handsomely exceeds 500 cu. ft. per acre per annum.

The chief weakness of *Sequoia sempervirens* is its frost-tenderness. It is accordingly considered to be suitable only in the milder parts of England and Wales—perhaps only within 50 miles of the south or west coasts or even only south-west of a Liverpool-to-Eastbourne Line.

Sequoia sempervirens has a marked bole-taper, but this feature is less pronounced than in its near relation, the better-known but less useful *Sequoia gigantea*, alias Wellingtonia. The soft bark of *Sequoia sempervirens* is very thick and serves as a most useful protection against fire.



Two views of the main hall at Earls Court taken from the balcony. The main cattle judging ring is shown on the right

FARM MACHINERY AND LIVESTOCK SHOW

London's 1952 Smithfield Show had a Wide Variety of New Equipment

THE 1952 Smithfield and Agricultural Machinery Show was held at Earls Court, London, from December 8 to 12, with its usual success and a large attendance of farmers and members of the agricultural industry, including many visitors from overseas. The Smithfield is a national show and therefore not comparable in size with such exhibitions as those held in Paris and Leipzig, but as regards quality it is considered to be second to none, which is borne out by the fact that the attendance of foreign visitors has steadily increased each year since the first post-war show in 1949.

At this London show nearly 1,500 beasts—cattle, sheep and pigs—were assembled from all parts of the country, a truly representative selection. No less representative were the exhibits on the machinery stands which displayed practically every item of equipment in the agricultural field, from spray nozzles and miniature ploughs to giant ditching machines and grass-drying installations.

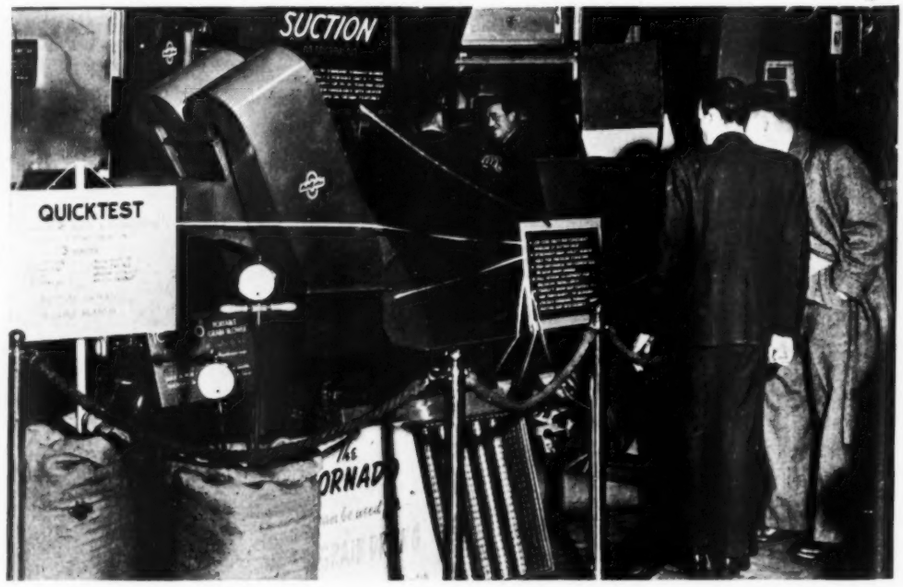
The Show, which might be described as a microcosm of rural industry, was, paradoxically, preceded by the worst London fog of the winter, which unfortunately took its toll of a few of the cattle brought up to Earls Court two days before the show opened. The number was less than 2% of the total entry, but no doubt many anxious moments were spent by stockmen and owners until the fog began to lift.

Cattle awards

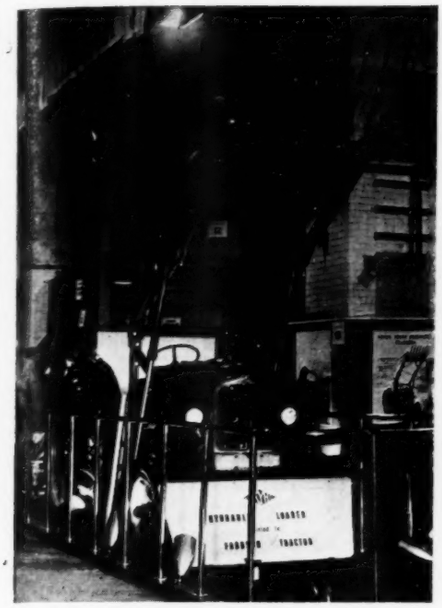
Champion and challenge cups for cattle were awarded as follows: For the best steer or heifer not exceeding 15 months, won by a Shorthorn; for the best steer and heifer above 15 months and not exceeding 2 years, won by a Shorthorn steer and an Aberdeen Angus heifer; for the best steer or ox in the classes, won by a cross-bred; for the best heifer in the classes, won by an Aberdeen Angus; the 100 Guineas Champion Plate for the best beast in the Show was won by a cross-bred, the Reserve going to a Shorthorn; the King's Perpetual Challenge Cup for the best beast in the Show was won by an Aberdeen Angus; the Duke of Norfolk Perpetual Challenge Cup, awarded to the breed society having the best exhibit of three pure-bred steers aged 12 to 36 months, was won by the Aberdeen Angus breed.

The machinery

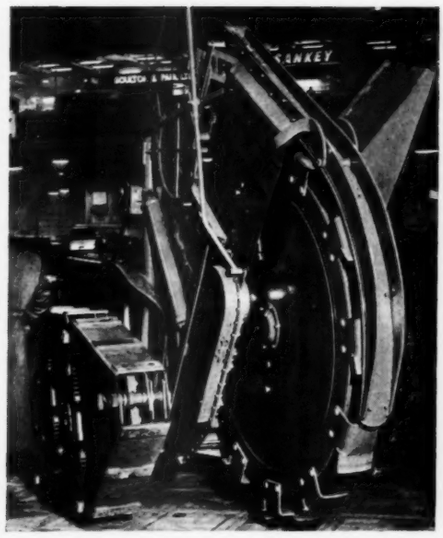
In WORLD CROPS last month we published an account of some of the exhibits at Earls Court, giving readers an idea of the wide diversity of machinery, implements and accessories to be seen. There were over 350 stands covering over a quarter of a million square feet, more than enough for the visitor to see in one day. New machines, naturally, attracted much attention and there was always a small



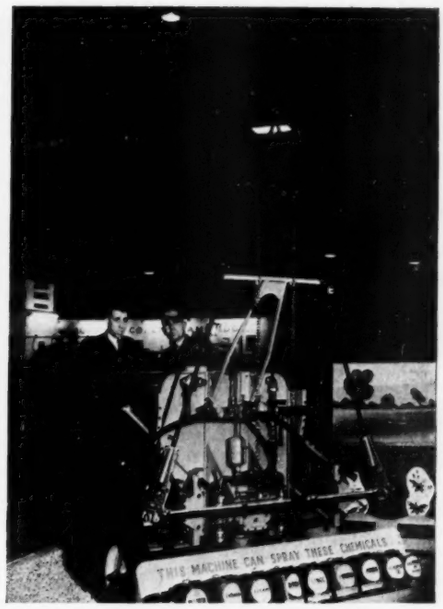
A corner of the Mitchell, Colman & Co. stand, showing the 'Tornado' portable grain blower



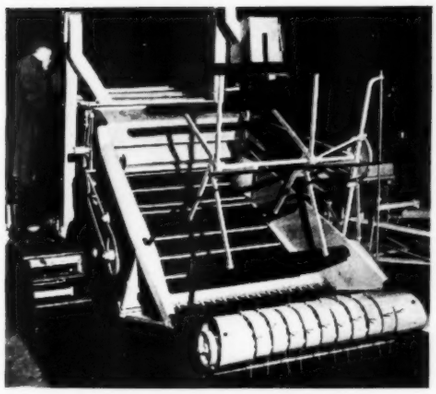
Skyhi hydraulic loader on the New Fordson Major tractor



Howard trench-digger and pipe-layer (rear view) on the Rotary Hoes stand. Note the Rotaped tracks on the tractor. The complete unit weighs four tons



Pest Control Ltd.'s new Fieldmaster high- and low-volume spraying machine



Ransomes' new combine harvester with 4-ft. cutting width

Mounted plough for the Clifford Model A.3

crowd round such exhibits as the two new Massey-Harris combine harvesters, the new Platypus crawler tractor and the latest additions to the mounted implements of the Ferguson range.

Smaller combines

Two new combine harvesters which also attracted considerable attention from the smaller-acreage farmers as well as the big men were a 6-ft. cut and a 4-ft. cut model—both trailer machines.

The 6-ft. combine is the McCormick International B-64 Harvester thresher, which will be produced by the International Harvester Co. of Great Britain this year. It is a straight-through machine. The knife has a full 6-ft. cut excluding gather on the dividers, the scoop-type feeder is 64½ in. and the cylinder itself is 64½ in.

An unusual feature is the single-support reel, similar to that used on the F-7-T and other McCormick International tractor binders. The absence of an outside reel support eliminates the tangling of straw around that member which makes the combine better fitted to working in long straw and heavy crops.

It will be possible to obtain the B-64 Harvester thresher with either engine or P.T.O. drive, the engine being the Petter air-cooled PAV-4. Grain tank or bagging attachment may be fitted and pick-up reel will also be made available. Transport width is 9 ft. 6 in.

Messrs. Ransomes, Sims and Jefferies have now added to their range of machinery a small tractor-drawn and power-take-off driven combine harvester with a 4-ft. cut, designed for the small or medium farm. This machine is to be manufactured under licence from the Bolinder-Munktell Co. of Sweden, and to meet immediate requirements of the 1953 harvest the first quantity of combines will be made available from Sweden. Transmission of power to the combine is by universal joint shafts from the tractor power take-off through a gear box and pulleys to the drum shaft, facilities for drum speed change being provided. The threshing unit comprises a six-beater drum with regulation of feed obtained by rotors on the incoming and outgoing sides of the concave. There is a separate elevator provided to return to the shakers all loose grain which overruns the sieves; the main flow of clean grain is augered across to an elevator which delivers the dressed crop to the bagging hopper.

Diesel power

A new diesel engine has been designed for the Farmall BM tractor, made at the Doncaster works of International Harvester Co., and is an alternative to the T.V.O. model. The new engine is reported to compare favourably with the standard T.V.O. alternative and the MD diesel engine produced by IH in America. It is anticipated that most of these new models will be sent overseas in the export market. The compression ratio is 16.5 to 1 and the opening pressure of the nozzles is 740 to 750 lb. It is a four-cylinder dry-sleeve engine with 4 in. bore and 5¼ in. stroke, piston displacement being 264 cu. in. (4,325 c.c.). Normal operating speed is 1,450 r.p.m., the tractor developing a maximum of 38.20 belt h.p. and 34.36 drawbar h.p.

The Turner diesel tractor can now be supplied with a half-track unit, enabling

a pull equal to the total engine power output to be exerted at the drawbar under conditions which would limit the use of wheeled tractors; with the half-track unit a maximum pull of 5,500 lb. can be exerted on grass.

Trench-digger and pipe-layer

One of the larger pieces of equipment at the Show was a combined trench-digger and pipe-layer which carries out both these operations in a single process. Designed for, and fitted to the New Fordson Major diesel tractor, it is sold as one complete unit by Messrs. Rotary Hoes Ltd. The complete unit weighs 4 tons and has a working capacity of 5-20 chains per hour, according to soil conditions and depth worked; maximum depth and width are, respectively, 3 ft. 6 in. and 9 in.

Silage handling

A new approach to the perplexing problems of economic silage handling was shown by Steel Fabricators (Overseas) Ltd. with the Seligman-Horn-Draulic grab which is claimed to be able to load 40-80 tons of silage per day from pit to trailer. The machine was designed by Mr. Douglas Seligman, well-known Hampshire farmer who runs some 3,800 acres carrying 1,400 head of dairy stock.

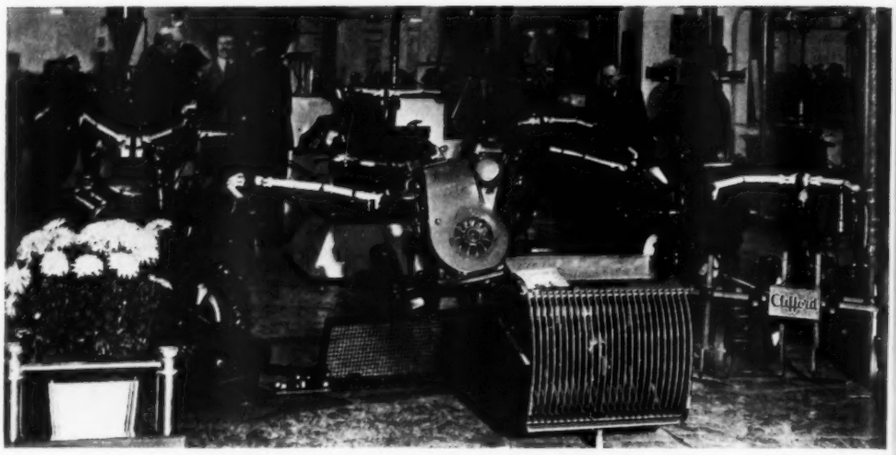
A new sprayer

A completely new medium pressure high- and low-volume trailer-type spraying machine was shown by Messrs. Pest Control Ltd. for the first time. This has been designed in an attempt to supply the needs of the small farm for an all-round sprayer; this 100-gal. machine is sold at £205. A new piston pump, the 'Arun,' has been specially designed, having a capacity of 15 gal. per min. at 200 lb./sq. in. at a speed of 500 r.p.m. Spraying rates of from 5 to 100 gal./acre can be obtained.

Smaller tools

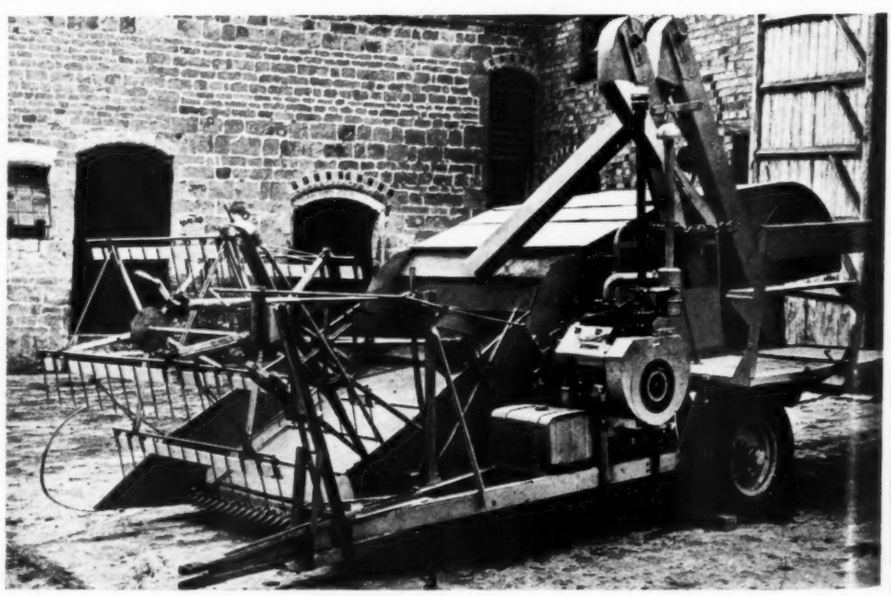
Amongst the new implements of the 'baby' type—market garden equipment, etc., which each year become more diverse and comprehensive—was a single-furrow mounted plough for the Clifford Model A3 cultivator which, complete with hitch, costs £23 10s.

Messrs. Ransomes, Sims and Jefferies have introduced what is claimed to be a



The stand of Clifford Aero & Auto Ltd.

Seen at the Press Conference of the Smithfield Show were *(left to right)* **Mr. E. P. F. Sutton, M.B.E., President of the Smithfield Club, Sir Patrick Hennessy, Chairman of the Smithfield Show Joint Committee, and Capt. E. N. Griffith, President of the Agricultural Engineers' Association**

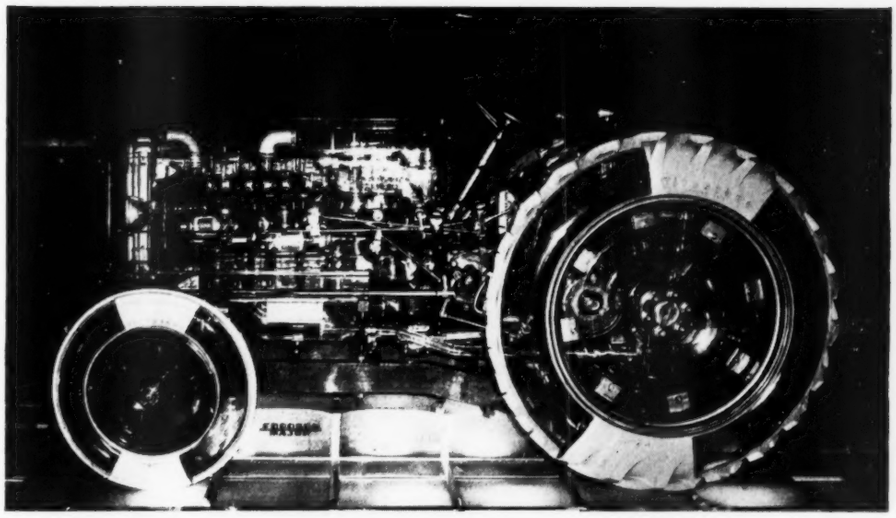


A 1952 McCormick International pre-production B-64 combine showing details of the single-support reel, the two-position drawbar, engine mounting and bagger platform. The pickup reel shown is not standard equipment

new principal of cultivation by reciprocating hoes in their new Vibro-Hoe, powered by a 98 c.c. Villiers two-stroke engine. This machine reproduces the action of hand hoeing, enabling work to be carried out close to the rows without spilling soil over the growing plants.

Smithfield visitors

Interest in this Show has been growing of recent years and 1952 was no exception. 680 overseas visitors were welcomed at Earls Court officially; this does not count those who did not take advantage of the facilities prepared for them. Many countries were represented. Many of these were cattle breeders looking for foundations stock for their herds; many others came to see the machinery and implements. Total attendance at the Show was 59,000 for the five days, compared with the record 66,000 in 1951.



For display only. A cutaway, illuminated New Fordson Major fitted with overhead valve four-cylinder diesel engine

CORRESPONDENCE

Australia's Tobacco Industry

TO THE EDITOR

Sir,

I am a tobacco farmer. My farm was started in 1950 and is as up to date as possible—spray irrigation, modern curing barns, bulk sheds, etc. There is quite a small community establishing itself here, as our conditions such as soil, water and climate are ideal for the cultivation of high quality leaf.

In 1950 considerable encouragement was given by the Federal Government to attract farmers into the industry. Many promises were given, which to date remain unfulfilled.

Last year, in spite of it being one of the worst on record so far as drought and seasonal conditions were concerned, we produced a high yield of good quality leaf. Unfortunately, our hopes of establishing the industry received a bad setback by the worst series of tobacco sales on record. Manufacturers, able to import leaf *ad lib* from other countries, bought only the pick of the crop and paid prices that spelt ruination to many farmers.

The conclusion we have reached after this disaster is that if the industry is to survive the following three points must be attained:—

(1) Government legislation to ensure that Australian leaf must be used before leaf may be imported from other countries.

(2) Growers co-operatives to be formed to assist the farmer.

(3) Standardisation of grades.

Manufacturers are against all three points and we are having a hard battle at the present time trying to put the industry on a sound solid basis.

Recently I came across your journal of WORLD CROPS, Vol. 4, No. 7, giving a brief, interesting outline of tobacco growing throughout the world, which impressed me immensely.

The thought struck me that you, with your comprehensive knowledge of the world's tobacco industries, may be able to assist us with information that could be of vital importance in formulating a method suitable to Australian conditions, of growing and marketing our product that will be of equitable advantage to both grower and manufacturer.

There is a big future for tobacco growing in this country if only it can be placed on a sound basis. We can learn a lot from other countries.

Any advice you may care to give will be appreciated and given careful consideration.

Yours faithfully,

V. C. C. MIDDLETON.

Bundaberg,
Queensland,
Australia.

NOTE BY THE EDITOR

It is not easy to reply to this. In developing tobacco industries in territories where the crop has not previously been grown, success is in our own experience largely dependent on the amount of encouragement and support likely to be forthcoming from the government.

Tobacco being an article on which most governments depend to a not inconsiderable degree for revenue, it usually is the case that success or failure is largely dependent on the amount of assistance that the government is prepared to provide to help the infant industry. If it accords with government policy to encourage tobacco growing there are many directions in which they can afford aid, *e.g.* by so modifying excise and customs duties to afford a measure of protection.

A very important matter is the provision of assistance in the practical aspects of growing and curing the crop, and in many countries governments have made elaborate provision of instructors in tobacco growing and curing through the Departments of Agriculture.

In regard to curing, this is often a highly skilled operation, especially flue curing, and unless growers can acquire the necessary technique there is little hope of success; other forms of curing are somewhat simpler, but at present the largest demand is for flue-cured tobacco. Co-operation between growers is valuable since it enables them to create grades and may help in the marketing.

In any case close collaboration between growers and tobacco manufacturers is highly desirable. If this is forthcoming it greatly helps developments; if it is absent success is hard to achieve. In general experience in a number of countries the successful development of a tobacco industry has been dependent on close collaboration between growers, manufacturers and government, with full or at any rate adequate provision of technical assistance in growing and handling the crop.

Front-End Loaders in Agriculture

FRANK FOSTER

THE population of the world today totals roughly 2,400 million people. This truly colossal figure, which is increasing faster than the relative production of the world's food, can make for peace or war according to how we handle the vital problem of more food for more people. It will readily be seen that the struggle for food has assumed gigantic proportions and is a factor of paramount importance. Until the first world war farmers in Britain used the slow farming methods of their grandparents. In the densely populated East methods were still more primitive. Crude wooden ploughs were drawn by oxen and even by men and women, and implements were used that in many instances had hardly been improved in the past 2,000 years! The first major step towards better means of cultivation and more productive husbandry came, in Britain, during the early years of the 1914-18 war. The tractor with its specialised farming equipment was developed and the days of the horse with its consequent slow progress were numbered. It was way back in 1916 that the first all-purpose tractor was fathered by the Ministry of Munitions of that momentous period. It became known as the 'M.O.M.,' and it played no small part in beating the German U-boat menace to our food supply line. The second world war gave an added fillip to the mechanisation of farming and today tractors with rear-mounted implements in great variety and tractors fitted with hydraulic loaders having a wide range of front-mounted implements are revolutionising the farming industry.

The hydraulic loader

The hydraulic loader can be fitted to standard tractors and its many implements take care of a hundred and one jobs on the farm. The versatility of the hydraulic loader enables it to be used daily, in all weathers, on this and that job, according to the seasons of the year. The available implements include shovels, manure forks, beet forks, crane jibs, scraper blades, green crop loaders, hay sweeps and hedger attachments. Using the applicable implement, the hydraulic loader can be uniquely handy on a host of farm jobs. With one-man operation, controlling everything hydraulically from the driver's seat, the loader will pick up a half-ton load of root crops, gravel, fertilisers, coal, sacks of corn, or bales of hay or straw, carrying it wherever it is wanted and dumping or lifting it on to a truck, etc. In addition to the routine loading jobs on a farm, many

Agricultural hydraulic loader fitted with manure fork having seven round detachable tines

farmers also use the loader for transporting logs, poultry houses, feeding troughs, fencing materials, etc., handling drainage tiles, moving dead animals, building farm roads, levelling and filling-in farmyard holes, lifting and removing rocks, loading and unloading machinery, etc. Its uses are so varied that on hundreds of farms it is working every day.

The heavy duty loader

Of similar importance to the agricultural hydraulic loader is the heavy duty hydraulic loader. This will lift, carry and dump loads of nearly two tons. One model, for instance, the Skyhi, has an extra large shovel of 1½ cu. yd. capacity. Other implements include beet fork, jib, scraper blade and digger teeth. The digger teeth are made of high-grade steel with hard-wearing tips. In use they are bolted to the front end of the shovel, the number depending on its width. For instance, six digger teeth are used with the 1½ cu. yd. capacity shovel, which is 6 ft. 8 in. wide, clearing the full width of the tractor. The teeth protrude 3 in. in front of the edge of the shovel and their action is to break up ground which is then scooped up into the shovel. With the combination of wide shovel and digger teeth it is quite easy to remove the surface layers of soil to any desired depth.

For the cleaning up of marginal lands and general land clearing, the scraper blade is used. This blade has a renewable cutting edge and in action is very similar to a bulldozer. It is of great assistance in cleaning up light scrub land and stoney ground.

Although the heavy duty hydraulic loader, tractor mounted, is universal in its application, it must be borne in mind that it cannot be expected to do the work of large bulldozers and land scrapers which are used on vast acreages. But when the area concerned is comparatively small the extra manoeuvrability and comparative low operating costs make it more than a worthwhile proposition.

Farmers in Britain are finding the heavy duty loaders of great use for clearing marginal lands for which they receive an attractive subsidy from the Government. Throughout the East large areas hitherto untilled are being brought into productive use with such machines. In Pakistan today you can see heavy duty loaders using bulldozing blade and shovel to clear and level rough land and, paradoxically, a few fields away you may see a camel stoically pulling a wooden plough that has not changed much in design in centuries. The world must be fed, the world *will* be fed, and the various applications to agriculture of the hydraulic loader will play no small part in the ultimate achievement.

Production of agricultural machinery in Britain

It is encouraging to note that the United Kingdom is now the second largest producer in the world of tractors and agricultural machinery. In 1950 the total value of such production had reached the astounding figure of £85,000,000, a large percentage of the output being exported all over the world. This figure is very remarkable when one recalls that in 1938 production only totalled £5,000,000. But a lot still remains to be done. Old-fashioned methods of cultivation lead to poor harvests, soil erosion and allied ills. Modern methods and modern farming machinery combine to give the only answer if we are to obtain the maximum from present farm lands and bring into food-producing use the millions of acres of low-grade and marginal lands throughout the world that can, by expert husbandry on modern lines, be made to produce food. The rapid growth of populations brings want and starvation to millions of people in China and India. As but one instance,

Heavy duty hydraulic loader with standard 1 cu. yd. shovel

it should be remembered that in India alone, under near-famine conditions, the population grows by the staggering figure of 5 millions a year. The only answer is food and more food, and this can only be achieved by adequate mechanisation. In no other way can the objective be reached and it *must* be reached if we are to prevent starvation in wide areas of the world. If large populations in distant lands are allowed to starve we shall not escape, no matter how full our own granaries.

Photos: Skyhi Ltd.

5,000 Southern Rhodesian Farms Analysed

Monoculture is still practised on one farm in every eight in Southern Rhodesia. An analysis of 5,345 farm propositions, conducted by the Central African Statistical Office, shows that in the 1950-51 season 662 farmers cultivated a single crop. Of these, 389 grew nothing but maize and 164 planted only tobacco. No crops at all were grown on 951 farms, although this does not mean necessarily that the land was idle. Many farms carried cattle, pigs, poultry, orchards, and exotic timber. The survey was concerned only with summer crops. The total area of the farms covered by the returns was 29,040,000 acres and the total area under summer crops was 786,000 acres. Nearly 20% of the farms were holdings of under 1,000 acres, 26% were between 1,000 and 2,500 acres and 31% were between 2,500 and 5,000 acres.

The number of Europeans actively engaged in farming during the 1950-51 season increased by 2.2% to 7,534.

A total of 59,268 acres was enriched with compost and kraal manure during the season and 708,000 acres under summer crops were protected by soil conservation, representing 90% of the area cultivated. There were 6,809 water storage dams, an increase of 36% in one season, and 115,950 tons of veld hay were cut from approximately 164,000 acres. The total number of 'farming propositions' in the country is probably 5,500.

New Agricultural Service in Venezuela

The establishment in Venezuela of a new agricultural advisory service by the Shell Caribbean Petroleum Co. may be of very considerable value to the Venezuelan farmer.

Conducting investigations in the field of agronomy, this service will publicise the results as widely as possible. The work carried out by the specialist field staff will lay particular emphasis on the increased production of essential food crops.

A well-equipped experimental station, which will be the headquarters of the Service, has been established under the direction of Dr. Mauricio Baez Meneses, previously Director of Agriculture for the Government of Venezuela.

Better Stocks of Peas

In collaboration with the Seed Production Committee of the National Institute of Agricultural Botany, the Home Grown Threshed Peas Joint Committee again operated the Dried Pea Seed Approval Scheme during the past season. Altogether 4,551 acres were field-inspected, representing 219 growers' crops—many in two or more pieces. Thirteen crops received approval as Field Approved Foundation Seed and 138 were graded as Field Approved Stock Seed.

Land Reclamation in Ceylon

The Government of Ceylon, which is now forced to import two-thirds of its food supply, would welcome increased technical aid from UN agencies in completing one of the most intensive land reclamation projects in Asia.

Mr. R. S. S. Gunewardene, Ceylon's Minister to Italy, recently told a meeting of agricultural experts of the Food and Agriculture Organisation that his Government was spending 670,000,000 rupees a year on food imports, while nearly three-fourths of the island is covered by scrub and jungle. Ceylon, he said, was forced to spend hard-earned rupees on food that could be grown at home. Ceylon's goal is the recovery of an area roughly the size of Denmark.

The Minister declared that 'the problem of Ceylon is the problem of the dry zones and the problem of the dry zones was once malaria. We have licked malaria. With FAO help we can lick the zone itself.'

A dam across the Gal Oya River in south-east Ceylon has been completed. It will irrigate 250,000 acres of land now being cleared of jungle. More than 600 families have been settled in the area, which it is hoped will support 25,000 people in 12 years. In the Gal Oya valley the Government has set up a Development Board to which has been assigned a number of FAO experts. They include an agronomist, livestock expert, canning specialist, expert on heavy earth-moving equipment, and in the northern dry zone a soils specialist and an expert in dry farming. A modern fishing industry has been planned and an FAO specialist has visited every large port in Ceylon, advising fishermen on how to increase the catch, while two FAO experts have been assisting in the modernisation of Ceylon's lumber industry.

These projects represent the heart of Ceylon's drive for a stable economy. The more self-sufficient Ceylon becomes in food production, the better her economy will be able to absorb fluctuations in the price of her major exports, tea, rubber and coconut.

Completion of the land reclamation programme will allow Ceylon to develop new branches of production, both in agriculture and in industry. In this connection, FAO is working closely with the Government of Ceylon in the development of sugar cane as a new crop.

Experiments have shown that sugar cane can be grown successfully in the northern dry zone and as a result 20,000 acres of newly recovered land are to be planted in sugar cane.

Agriculture in South Korea

A 12-man team of agricultural experts, jointly sponsored by the United Nations Korea Reconstruction Agency and the Food and Agriculture Organisation of the UN, is in Korea on a six-months' job of developing a five-year agricultural rehabilitation programme in Korea. This UNKRA-FAO Mission has been appointed by FAO and will be responsible to FAO for the technical recommendations it makes. The following article, based on information supplied by FAO, Rome, describes the agricultural conditions which the team is now studying.

CHIEF of this Mission is Mark B. Williamson, of Milton, Tenn., U.S.A., who takes leave as Deputy Director of the Agriculture Division, U.S. Mission to the Philippines (MSA), and who formerly served under General MacArthur in Tokyo as Director of the Agriculture Division of SCAP in the Allied Powers' headquarters.

Joint Chief of the Mission for Technical Co-ordination is Sir Geoffrey Clay, Agricultural Advisor to the Secretary of State for Colonies in London. The Mission includes two experts in agricultural production, and individual specialists in agricultural economy, agricultural statistics, marketing, irrigation engineering, food consumption and distribution, rural sociology, forest management and fisheries.

A preliminary prospectus has been prepared by FAO. For advance briefing, FAO has also provided the Mission with a special report on the present condition of Korean agriculture.

R. L. Du Pasquier, formerly Director of Agriculture in Indo-China, has recently returned from a survey of the agricultural conditions, prospects and problems in Korea.

Conditions in Korea

Du Pasquier's report says that despite the two deep thrusts into South Korea of the Northern armies and the destruction caused by the fighting, the farmers of South Korea, ' with a remarkable energy have resumed cultivation and maintained production at a relatively high level.' Today, in fact, the tilled area in South Korea is only 13% to 14% below what it was when the Korean war began.

Korean agriculture has been in steady decline since 1941. Before that time, Korea had a surplus agricultural production and was able to export each year 200,000 tons of rice, 30,000 to 40,000 head of cattle, and 1,294 tons of silk thread.

From 1941 to 1945, during the war, crop production decreased because of fertiliser shortage, livestock were reduced to two-thirds of the pre-war stock, and forests were over-exploited.

From 1946 to 1950, when population rose by almost 4 millions, an almost sufficient production for local consumption was reached in South Korea. The livestock situation, too, showed improvement. But as a result of the separation from North Korea there was a lack of fertilisers in South Korea and they had to be imported from abroad. The forest situation continued to decline.

Harrowing rice land preparatory to planting

' Today,' as the Du Pasquier report says, ' recovery and development of agriculture and forestry must be considered the main aims in the rehabilitation plan for South Korea.' For South Korea's life depends mostly on production from the soil.

Livestock have decreased to such a degree that in many parts of South Korea tillage of the land is difficult and the supply of meat and eggs has declined considerably. There is a general food shortage, and the situation has been made more difficult by the arrival of Northern refugees, which has pushed South Korean population up to 21,654,031, as compared to 20,300,000 in 1949.

Fifty-six per cent. of South Koreans are farmers. The land is overcrowded, for the terrain is very hilly, and the land devoted to agriculture represents less than a quarter of the total area. The average number of people living directly on farm land is 5.6 per chobu (1 chobu = 2.45 acres, or nearly 1 hectare) and the average area per farm is only 0.9 ch. In fact, three-quarters of the farmers have less than 1 ch. and more than one-third have less than 0.5 ch. ' This is not sufficient to secure work possibilities and a decent life for the peasants,' Du Pasquier remarks, and ' as it is impossible to reduce rapidly the number of farmers so long as industry is not more developed, it is necessary to obtain the maximum yield from the present cropped area, and to have the most thorough and best utilisation of the soil.'

Soil utilisation

Land utilisation can be divided into three heads—agriculture, livestock, and forestry.

The land devoted to agriculture is as much as possible utilised for rice production.

Planting rice seedlings

The second most important crops are the so-called 'summer grains,' which include cereals grown during winter or spring and harvested in June. Among these, barley is predominant and wheat comes next. 'Fall grains' include cereals, beans and pulses grown on dry fields during the summer and harvested in the autumn. Most important are the soya bean, Italian millet and buckwheat. Irish and sweet potatoes are also grown extensively.

Industrial crops are cotton, ramie, hemp, tobacco, ginseng and pyrethrum.

Land devoted to livestock does not occupy a wide area. The cattle are generally raised with a very small amount of grass or pasture. They are fed with rice or millet straw and complementary foodstuffs and fodder gathered in the forest land, such as Kudzu vines.

The forest land, which extends over three-quarters of the country, should be the main source of wealth. But it has so deteriorated that it is not able to furnish sufficient fuel and timber for local consumption. 'South Korea must be considered more as a forest land than an agricultural one. It will never be possible to extend agriculture and pastures to a large scale. The whole country is covered with steep hills and mountains which can be devoted only to forest.'

Land reform

There has been some degree of land reform in South Korea since 1946. All farmers pay a rather high income tax and those farmers who have received land pay a high percentage of their crops as compensation to former owners.

Irrigation and drainage

Lack of water is the main factor in irregularity of the rice crop, and is more important than lack of fertilisers. The only way to secure a higher and more constant yield is to extend irrigation.

In spite of the efforts made under the Japanese, the area of well-irrigated land remains very low and the area of paddy fields without irrigation is very high.

Improvement of production

The improvement in quantity and quality of the production of farmyard and compost manures must be a principal aim. Other organic fertilisers that can be provided locally are seaweeds, fish meal, soya bean and cotton seed cakes. Fish meal has completely disappeared with the reduction of fisheries after the liberation.

Du Pasquier estimates that South Korea would have to import an annual 800,000 to 1,000,000 tons of fertiliser to meet its needs. Korea cannot afford to spend such an amount of foreign currency without any compensatory export, and even the present importation of 450,000 tons is a heavy burden.

Korea depends for its supply of insecticides and pesticides on foreign countries. The only local product is pyrethrum, which is grown on Cheju-do Island. Unfortunately, production has decreased as a result of the low prices.

The low average yield of most of the Korean crops is not only due to the climatic or soil conditions, but also to the poor quality of the cropped varieties. For rice, the possibilities of certain foreign varieties are known, and the Ministry of Agriculture has prepared a plan for the importation, the multiplication and the distribution of well-known Japanese varieties.

Reclaiming waste land

Waste land that can be reclaimed belongs to two different categories: (*a*) the tidal area, and (*b*) the uplands.

The available tidal area which can be reclaimed is estimated to be 38,477 ha. and is located on the western coast. Fifteen projects covering an area of 3,196 ha. are under construction and will be achieved by 1953. Ten new projects covering 1,453 ha. have been prepared.

The upland area is much more extended land. It comprises many low hills and the smooth slopes of the mountain's foot suitable for pasture or agriculture. They are now covered with a nearly useless vegetation of small bushes and coarse grasses. Between 1946 and 1949 a new potential reclamation estimate gave a total of 240,000 ha. for South Korea; this area might be doubled after a more complete investigation.

This waste land should be utilised to increase the acreage of the small farms, provide pasture and fodder crops for cattle, and for the settlement of the refugee farmers coming from North Korea.

Reafforestation

Korean forests are in the most critical situation. Though forests cover three-quarters of the country, annual growth is estimated to be no more than 56% of domestic needs for timber and fuel, and if the reafforestation work is not strongly taken in hand by the government the forest will continue to disappear.

Reafforestation is closely connected with the improvement of agriculture and must be considered as fundamental for the rural economy. The following results can be expected from this essential work:—

1. The regularisation of watercourses and the control of erosion will prevent disastrous floods and provide more water for the paddy fields.

2. The wood-fuel which could be produced can replace utilisation of straw as fuel and the production of farmyard manure or compost increased.

3. Forestry will help and supply employment.

The present forest situation is not the result of the war, but the result of age-long bad management and practices. In order to increase the returns of the forest land and to wake in the farmers more interest in reafforestation, the growing of trees which can provide useful products for food or industry should be extended.

Livestock restoration

The reconstitution of livestock must be considered as one of the first aims. Cattle need the most attention, as they are essential for the tillage of the land.

The main problem is to provide, as soon as the war is over, a sufficient number of draft animals to promote rapid recovery.

Mechanisation

In a country where rural land is over-crowded and farmers are under-employed, and where fields are small, the utilisation of tractors cannot be developed on a large scale. Animal- and man-power will remain the best and cheapest manner in which to work the land.

But during the period of cattle shortage, tractors could ensure the tilling of the land more thoroughly. They could be useful, especially in the northern area, to help farmers who have no draft animals, to reclaim abandoned fields and to put them under cultivation immediately after their return and before they can obtain cattle. The more suitable type for work in small fields is the caterpillar tractor used commonly in vineyards in France. The rice field tractor of medium power from America could also be used.

Reconstruction and re-equipment

'It would be of great benefit if the authority for the reconstruction of Korea's war damage could rebuild completely a certain number of villages, and avail itself of this opportunity to establish a better type of farm.

'Tools, ploughs and farm machines lost or destroyed urgently need replacing, but it would be of little value to import American or European implements, as they would not be suitable for Korean agriculture. Small gardening tools, water pumps and sprayers could, however, be useful.

'Japan, and perhaps Thailand, China and Viet Nam, whose agriculture is similar, could provide some well-adapted material and machinery. But, for such implements as ploughs, sickles, hoes, etc., the best thing would be the importation of iron in order to manufacture the items in Korea.'

Cooperatives

Reconstruction and re-equipment should be undertaken in the frame of the co-operative associations; these are necessary to the rural life of Korea. The small area of farms does not allow their owners to take care of the products, process and sell them under the best conditions. The Federal Financial Association aims, it is true, at sustaining the farmer by short-term loans and providing fertilisers or other commodities, but it is a purely governmental organisation and has also as its object the collection of rice for the land reform annuities and income tax.

Cooperative associations must be completely independent, and must not be para-governmental organisations. They have to defend the farmer's interests even against government and must never be connected with such activities as collection of products, or official inquiries about the farmer's situation.

Improvement of technical teaching

A serious problem is the lack of specialists in soil science, ecology, genetics, botany and phytopathology. As the Suwom College is not able to give full instruction in these matters, it will be necessary to send at least 20-25 students to foreign universities or institutes.

Harvesting rice

Later, the best way to train Korean high technicians will be to install at Korean agricultural colleges competent foreign professors, and thus raise the teaching to the level of foreign establishments.

Du Pasquier concludes that, 'in the many fields examined the Government of the Republic of Korea is determined to work hard to bring about the ultimate recovery of the country's economy, but under present conditions Korea has neither the resources nor the funds to do this herself, she must therefore look towards the United Nations for assistance, which should take the form of material aid or supply and also that of technical advice by competent experts in the required fields.'

Photos: U.S.I.S.

COMING EVENTS

Being a list of the principal agricultural shows, exhibitions, etc., in Britain during 1953 which are of interest to readers of WORLD CROPS

National Power Farming Conference	Feb. 10-12	Cheltenham, Gloucestershire
British Industries Fair	April 27-May 8	Earls Court and Olympia, London, and at Birmingham
Royal Ulster Agricultural Show	May 20-23	Balmoral, Belfast, N. Ireland
Royal Windsor Horse Show	May 14-16	Windsor, Berkshire
Chelsea Flower Show	May 20-22	Royal Hospital Grounds, Chelsea
Bath and West and Southern Counties Show	June 3-6	Bath, Somerset
Three Counties Show	June 9-11	Hereford, Herefordshire
Royal Highland Show	June 23-26	Alloa, Scotland
Royal Counties Show	July 1-2	Swaffham, Norfolk
ROYAL AGRICULTURAL SHOW	July 7-10	Blackpool, Lancashire
Great Yorkshire Show	July 14-16	Hamgate, Yorkshire
Annual Meeting of the British Association for the Advancement of Science	August 2-9	Liverpool, Lancashire
The Dairy Show	Sept. 27-30	Olympia, London
SMITHFIELD SHOW AND AGRICULTURAL MACHINERY EXHIBITION	Dec. 7-11	Earls Court, London

CONFERENCES AND LECTURES

Chemical and Biological Control of Insect Pests

Dangers of Chemical Insecticides and Need for More Biological Research Discussed at a Recent Meeting

'INSECT Population Balance and Chemical Control of Pests' was the subject of a joint meeting held by the Crop Protection Panel of the Agriculture Group of the Society of Chemical Industry and the Association of Applied Biologists, recently held in London. Altogether eight papers were presented.

The morning session was opened by **Dr. A. M. Massee,** Head of the Entomology Department at East Malling Research Station, who reviewed the changes of pest and predator in English apple orchards since the beginning of the century. Fifty years ago, he said, 60-70 species of pests were likely to be found in the orchard, as well as 40 or so beneficial insects and some neutral ones. With the introduction of caustic soda and lime washing in 1918 and the tar oil winter wash in 1921-22 the number of pests was reduced to about 30. Some of these, however, became more numerous, *e.g.* the red spider mite. The number of pests was steadily reduced through the introduction of DNC and petroleum washes, DDT and BHC, and only six major pests are now left in apple orchards.

In spite of this great reduction, Dr. Massee pointed out, nearly as much harm may be caused today by the few remaining species which are now to a great extent unmolested by predatory insects. The duty of the entomologist today, he said, is to make an entomological and biological survey of the orchard, taking all insects into account, when testing a new spray against one pest. This work entails a considerable amount of recording to be effective, but it is essential that the entomologists and the spray chemists collaborate to a much greater extent than they do at present. In Dr. Massee's opinion, many growers were too 'chemical minded' and inclined to overspray.

The fruit tree red spider mite

Dr. E. Collyer, also from East Malling, read a short paper on the fruit tree red spider mite and its predators. For the last six years workers at East Malling have been carrying out a study of predators and about 50 species, excluding spiders, have been found. At least 20 of these are phytophagous—that is, they feed on plants. Spraying against fruit tree red spider mite, said Dr. Collyer, is *one* of the first causes for the mite's increase; it has five generations each year.

Insect population counts in a virgin overgrown orchard have been going on for the last three or four years and many species of predators have been found in this orchard, covering the whole season. Here, as a result, the red spider mite remains at a low level and, compared with conditions in a commercial orchard, it has been found that it has a delayed time of hatching. In commercial orchards, too, there is absence of predators early in the season, probably due to winter washes. Therefore, mites can pass two generations before predators appear again in appreciable numbers.

Dr. Collyer ended by warning growers against the potential dangers of parathion as an acaracide. In Essex the greenhouse red spider mite has appeared in several areas, following the use of this chemical. And this might increase; it breeds more rapidly than the red spider mite, has more generations per year and many host plants.

Outbreaks resulting from spraying

Instances of pest outbreaks as a result of spraying were given by **Mr. M. E. Solomon**, of the D.S.I.R. Pest Infestation Laboratory. He cited the work of Dr. Pickett *et al.* in Nova Scotia, who have found that outbreaks of mussel scale and red spider mite are liable to increase after the use of sulphur sprays. Similarly, workers in California have found that the cotton cushion scale has increased on citrus trees after applications of DDT. In South Africa one of the worst outbreaks of codling moth occurred after 17 applications of lead arsenate.

Mr. Solomon expressed the opinion that the chemical cart had run away with the biological horse and emphasised that the problems of pest control are primarily ecological.

Selective insecticides

'It should be possible to produce systemic insecticides which will control insects that suck and eat the leaves,' said **Dr. R. M. Greenslade** of Pest Control Ltd. In time, deliberate searching should enable selective insecticides to be found which will kill definite groups of insects by reason of their physiology. Some systemic insecticides have a contact effect and should be applied systemically. Schradan preparations, however, have very little contact effect and can be sprayed directly on the plant.

Professor G. C. Varley, of Oxford, described some of the work he has been doing on insect population theory and economic entomology. He had found it necessary to study reproduction rates in relation to host density in order to find some sort of fundamental relation on which to work.

The agricultural chemist

'Chemicals are no substitute for good husbandry.' These were the opening words of **Dr. E. Holmes,** of Plant Protection Ltd., who spoke for the agricultural chemists. Some Americans believe in using chemicals against pests regardless of after effects; in this country we are inclined to test all possible side effects of a chemical first. In his opinion a middle course between these two extremes is what is required. More work on biological fundamentals should be done by the official research stations, university departments, etc., while the discovery of new chemicals should be left to the chemical firms themselves.

A biological revival was called for by **Dr. J. S. Kennedy,** of the Agricultural Research Council's Unit of Insect Physiology. He pointed out that all pest control is necessarily biological.

A farmer's view

The last speaker was **Mr. F. H. Garner,** general manager of a company which owns farms having 7,000 acres in East Anglia. He told the audience that on his farms he sprayed carrots against weeds and the carrot fly; parsnips and onions for weeds; potatoes against blight and to kill the tops; celery against blight; cereals against weeds; grass leys against weeds; he also dusted against wireworm in grass and to correct for mineral deficiencies. The requirements for an agricultural spray were that the chemicals must be as safe as possible and, in some instances, have lasting effect; they should be able to be used with dyke or pond water and leave no sediment, and they should be capable of being used in low volume machines. Sprays are naturally preferred if they have more than one action, *e.g.* kill two pests at

once, and they should be non-corrosive and have no harmful effect on birds. Mr. Garner was emphatic that the farmer should be able to do his own spraying rather than employ a contractor. To the machinery designer he suggested the use of glass portions, enabling visual access to the contents of the spraying machine. Other desiderata were reduction of the amount of chemical necessary, absence of tainting hazards and reasonable reliance on dusts not to blow on to the wrong field.

Discussion

Opening the discussion, **Dr. O. W. Richards,** of the Imperial College, stressed the long-term nature of experimental procedure and the big difference between short and long term results.

Dr. V. B. Wigglesworth, Director of the Unit of Insect Physiology, said that the increased use of chemicals emphasises the need for entomological research and the biological approach. Obtaining the right people to do these jobs was a difficulty. **Dr. B. P. Uvarov,** speaking on the desert locust problem, said that at the present stage the international locust control organisation is only just holding the locust in check by modern insecticides. Ecological control, he said, is the great hope and meanwhile insecticides allow a none too long breathing space in which to carry out these long-term projects.

Health Hazards in Crop Protection

WE have already published a number of articles on this subject in WORLD CROPS and particularly in view of the recent passage of the Agriculture (Poisonous Substances) Act by the British Parliament, especial interest attaches to a lecture recently delivered by **Dr. J. M. Barnes,** Director of the Toxicology Unit of the British Medical Research Council, before the Crop Protection Panel of the Society of Chemical Industry under the chairmanship of Dr. R. A. E. Galley.

The lecturer reminded his audience of the considerable public concern on this subject. It had been suggested that insecticides are being applied without reasonable care for the operators, that there should be stricter safeguards on behalf of consumers of foods and that certain substances should be prohibited on the grounds that they are too poisonous. The need seemed to be to reach a balanced judgment after examination of available data.

Dr. Barnes considered the hazards to those applying the material and to those who consumed food containing residues. The operational hazard generally is capable of assessment, for example, by comparing the accident rates associated with pesticides with those associated with machinery. It is normally possible to advise on the precautionary measures necessary under particular conditions to decide that a given substance is too dangerous to permit its use at all. On the other hand, the assessment of the importance of residues in foodstuffs is often very difficult. Dr. Barnes emphasised that investigations of the toxicology to mammals should be carried out on every chemical which might leave any residues in food. He drew attention to the difficulties in carrying out tests to assess the importance of small residues ingested over a long period and to the fact that it is not possible to be certain regarding the application of the results of animal experiments to man. Official authorities and manufacturers are generally aware of this lack of precision and methods of use normally include reasonable margins of safety.

Some attempt should be made to balance the advantages of newer pesticides against the disadvantages, of which the hazards were very important. He sometimes wondered whether some new developments really are advantageous.

Discussion

In the course of the discussion following the paper various speakers mentioned the undoubted advantages to be had from using pesticides. Widely varying views were expressed on the degree to which dangers to operators can be met by instruction and by the co-operation of the workers themselves. **Dr. Goldblatt** felt that workers would take all the necessary precautions when using, for example, the phosphorus insecticides if they were told what the risks were. **Mr. Leonard Hill,** from his experience as an employer, doubted whether this was sufficient. In this connection **Sir Harold Tempany** also drew attention to the difficulties encountered when using toxic chemicals amongst native workers and the lecturer remarked upon certain cases of gross misuse which had come to his knowledge.

More than one speaker felt that insufficient work is being done on the effects of continued ingestions of small doses of pesticides. The need for better methods for detecting and measuring residues in foods was also mentioned.

In proposing a vote of thanks to the lecturer, **Mr. H. K. Smith** felt that the lecture and discussion had emphasised the need for better facilities for measuring mammalian toxicity.

Official Tractor Tests—Are They of Real Use?

'OFFICIAL tractor test reports can give very useful and realistic guidance to farm performance to the more technically-minded reader, provided some assistance in the form of explanatory details is available for reference.' This was the contention of **Mr. T. C. D. Manby,** Senior Scientific Officer at the National Institute of Agricultural Engineering, when he presented a paper entitled ' Are Official Tractor Tests a Realistic Guide to Performance on the Farm ' at a recent meeting of the Institution of British Agricultural Engineers.

There were in Britain, he said, at least three possible approaches to the assessment of the capabilities of a new machine: (*a*) by direct observation, (*b*) studying British Standard Tractor Test sheets and (*c*) studying a N.I.A.E. Report.

The B.S. test was the result of the need felt by British salesmen when facing American competition, and represented an attempt to provide results comparable to those of the Nebraska test in the U.S.A. However, the British climate being what it is, it was found necessary to carry out drawbar tests for pneumatic-tyred tractors on a tarmacadam surface as opposed to the clay track used in Nebraska. Tests on tracklayers and steel-wheeled machines are carried out on grassland overlying heavy clay.

In the complete N.I.A.E. Reports, in addition, tests are made on grassland, stubble and at least one type of loosely cultivated land. For belt tests the B.S., N.I.A.E. and Nebraska test codes are alike in that power is measured by a belt-driven dynamometer and the power indicated is that which would be available at the pulley of, say, a hammermill. In this country allowances are made for belt slip, whereas in Nebraska no allowance is made.

Mr. Manby gave details of the performance tests and analysed the more important performance figures. He maintained that, even though the reader had no engineering knowledge, the report can convey one important fact, *viz.*, that the tractor has completed a reasonably arduous mechanical test without serious mishap.

Many of the younger generation of farmers, on the other hand, together with agricultural advisors, technical sales staffs and not a few of the better educated farmers of the older generation, have enough basic knowledge to make full use of the reports.

Referring to practical working tests in the field, Mr. Manby said that tests could never be fully comparable—one tractor

with another—and the difficulty of producing an impartial report under such conditions is immense. He added, however, that it was not unlikely that an attempt would be made in the future to organise an addition to the N.I.A.E. testing scheme whereby tractors can be worked under official observation for some hundreds of hours.

Discussion

The discussion following Mr. Manby's paper was opened by **Mr. T. Nellist Wilkes,** a farmer from Worcestershire, who maintained that the N.I.A.E. reports do provide a realistic guide. He had a few suggestions to offer for changes and additions to the report, including the extension of test figures to include more agricultural operations, comparative studies of the tractor with both mounted and trailed tackle and information on fuel economy and probable maintenance.

Mr. A. B. Lees of Harry Ferguson Ltd. maintained that measurement of drawbar horse power tends to delude many farmers and pointed out that the drawbar pull figure is not much use when dealing with mounted implements; plough resistance figures similarly convey very little to the farmer. Measurement of belt horse power in his opinion came nearer to the farmer's requirements. **Mr. Ben Burgess,** a tractor dealer from Norfolk, said that in his experience only about two out of 50 of his customers could really understand tractor reports. He favoured the simplification of existing reports rather than additions to the present number of tests; otherwise reports might become a matter of academic interest only. **Col. P. Johnson** of Roadless Traction Ltd. praised the tests for their value to technical staffs of manufacturers, while **Mr. C. Culpin,** of the N.A.A.S., speaking as one who interprets the reports to farmers, said that they were invaluable, particularly the belt horse power tests.

Other speakers included **Messrs. L. R. Bomford, R. B. Ransome** and **J. Chambers.**

Shell Leaflets

Four new agricultural leaflets (Nos. 38, 39, 40 and 41), recently issued by Shell Chemicals Ltd., deal with Shell Schradan for the control of aphids and red spider mites on a variety of crops, recommendations to persons handling and using Schradan, Shell Azobenzene and DDT vapour sprays, and the life cycles of root-knot and potato-root eelworms.

RESEARCH DEVELOPMENTS

Thornless Mimosa Invisa

In May 1951 van Emden reported in *De Bergcultures* a thornless mimosa; this report, however, for one reason or another, did not get the attention which it merits.

Mimosa invisa Mart. can be considered one of the best soil-covers and green-manures, but a great drawback is its possession of sharp thorns which prevent it from occupying a place in tropical agriculture worthy of its other characteristics. On fallow land it could become

Thornless Mimosa on the left, compared with the thorned variety

of great importance, *e.g.* in Deli-tobacco culture. The sharp thorns, however, present an obstacle to its extended use, and native labour object very strongly to working barefoot in it.

The search for a thornless variety has been long and intensive. In the course of several years many thornless plants were found in the Division for Breeding Annual Plants of the General Agricultural Experiment Station at Buitenzorg (Java), but these proved either to belong to other species or, if true *Mimosa invisa*, did not breed true to the thornless character.

On the advice of Dr. H. J. Toxopeus, former head of the Botanical Division, the search was resumed in 1935 by Mr. A. S. Bolt, at present manager of Tjurug Estate near Kendal (Java), who, after much searching in 1942, succeeded in finding a thornless plant. When, owing to wartime conditions, he had to leave his estate, all plants with prickles had been eradicated. On his return in 1948, he found that the thornless variety had held its own very well against its prickled competitors. Further multiplication was started and it became evident that the thornless variety bred true to type and in other characteristics did not differ from the original *Mimosa invisa*.

As *Mimosa invisa* forms a very good soil-cover, suppresses weeds excellently, produces a good mulch and a great many root-nodules, this new variety must be considered a very welcome addition to the large assortment of soil-covers and green-manures, available for tropical agriculture.

G. G. Bolhuis.

LITERATURE

van Emden, J. H.: 'Doornloze mimosa,' *De Bergcultures*, **20**, 1, 1951, p. 201.
van Helten, W. H.: 'Practische ervaringen met verschillende soorten groenbemesters,' *Mededelingen v.h. Algemeen Proefstation voor den Landbouw*, Buitenzorg, No. 16, 1924.
Burkill, I. H.: *A Dictionary of the Economic Products of the Malay Peninsula*, 1935.
Heyne, K.: *De nuttige planten van Indonesie*, 1950.
A Manual of Green Manuring, Dept. of Agric., Peradeniya, Ceylon, 1931.
l'Emploi des legumineuses comme engrais verts, plantes de couverture et azbres d'ombrage dans les pays tropicaux, Institut International d'Agriculture, Rome, 1936.

Top Dressings Recommended for New Zealand Pastures

How the judicious use of fertilisers could increase New Zealand's farm crops is at present being closely studied by fertiliser manufacturers and the government in New Zealand. As a result a statement of policy may be made shortly which will possibly include plans for the increased production of superphosphates within the Dominion.

Special attention in this respect is being given to hill country, which, it is thought, could be greatly improved if seeded correctly and treated with the right type of fertiliser. Grassland experts say there are 10 million acres of this kind of land which would respond to treatment, though all the land would not give equal results.

There are, however, a number of difficulties to be overcome, since much of the hill land requires considerable quantities of lime before anything else can be done with it. Hitherto, clovers and grasses have been sown by air on such country, but, in many cases, the strike has not been good because of this lack of lime.

How to get large quantities of lime on to steep hill country is, therefore, one of the problems which is being considered. To spread it by air would be much too costly

and to haul it on to the land would prove a difficult operation. It is possible, however, that research now being undertaken into the lime-molybdenum relationship in New Zealand soils might prove helpful. This is not, as yet, at a sufficiently advanced stage to be authoritative, but it has been found that on some soils small quantities of molybdenum will replace lime to some extent. Experiments have shown that on some country a little lime and molybdenum give results similar to those previously obtained with larger quantities of lime on its own.

If, therefore, it is eventually proved that on some soils the spreading of a few ounces of molybdenum salt per acre will greatly cut down the quantity of lime to be applied, spreading by air might prove economical.

Other problems include finding a reasonably cheap aircraft to replace the out-of-date Tiger Moths now being used, and the production of the extra superphosphate that would be needed.

Aerial topdressing

In addressing the New Zealand Division of the Royal Aeronautical Society, Mr. E. A. Gibson, New Zealand Director of Civil Aviation, has said that he and the operators have suggested that a prototype of a suitable aircraft could be designed and built in the Dominion. Government help would be needed and the Government was giving the matter consideration. He said that, provided sufficient superphosphate was obtainable and suitable aircraft made available, aerial topdressings could increase farm returns by £50 million to £100 million a year. One authority has estimated that every acre treated could be expected, in the following year, to produce £5 more meal and wool from improved pastures. Another authority, he said, thought that on suitable hill pastures, or where the right type of clovers and grasses are sown in the first topdressing, every ton of superphosphate spread would produce, in the following year, an addition to the country's wealth of £100.

Already 13% of all the superphosphate manufactured for use in New Zealand is dropped by aircraft, the cost of this being from £3 10s. to £5 per ton.

The response that could be expected from the pastures as a result of topdressing with superphosphate could be measured by the sevenfold increase in butter, the twentyfold increase in cheese and the threefold increase in meat production brought about in New Zealand over the past 40 years largely as a result of improving her ploughable land.

The unrestricted demand for superphosphate in New Zealand is now estimated to be about 200,000 tons greater than the supply available. This could be considerably increased if such extensive plans were adopted. Also, to be best suited for distribution by air, the supers should be reduced to pellets about the size of a red clover seed and of a greater concentration than is currently available either in mixtures or the straight 20% supers.

Pyrenone for Seed Protection

Availability of a Pyrenone wettable powder in slurries as a protection for seeds in storage against insect infestation has been recently announced by U.S. Industrial Chemicals Co. Division of National Distillers Products Corporation.

Pyrenone is a combination of pyrethrins and piperonyl butoxide, toxic to insects but non-hazardous to humans and animals, thereby permitting its use on seeds which eventually may be used for milling for human consumption or animal feeds, and does not inhibit germination.

This firm state that investigation of the potentialities of Pyrenone in the seed protection field began more than three years ago after Pyrenone formulations had proved effective against many varieties of insects. They also showed effectiveness against insects invading warehouses, elevators, etc., where food and food products are processed or stored. Its advantage of being non-toxic to humans and animals has given it acceptance in the food field.

The lack of any deleterious effect on germination was stressed as a result of the investigation. Tests revealed that germination was not impaired even when Pyrenone is used at dosages several times that recommended. Germination tests conducted on seed corn, oats, barley, wheat and watermelon seed showed no detrimental effect.

World Agricultural Production—1951-52 *Concluded from page 10.*

make them more attractive to farmers, following the review of production costs carried out by the Australian governments during the year.

The main overall features of the production position in terms of index numbers based upon the pre-war figures are shown in Table 9.

The commodity position

The supply situation of many commodities is easier. World exports of wheat and wheat flour were larger than last year. Total shipments of coarse grains remained about the same, but the world supplies of rice became increasingly scarce, bringing about a serious situation in rice-eating countries. Livestock produce, such as milk, meat and cheese, fell below last year's level. World production and export supplies of oil and fats considerably increased and prices declined. World production of sugar expanded by 1.7 million tons, while international trade in fresh and dried fruit also expanded considerably, especially citrus fruit.

The world coffee industry is also reported to be more prosperous than ever before. Production increased and prices remained steady at a high level. Tea supplies were also larger than at any time since the end of the war, and despite 30% decline in prices they were still 150% to 200% higher than before the war. Cocoa production was lower than at any time since the abandonment of international allocations; tobacco output increased by 3% compared with last year, rubber output is likely to show an 11% drop, while cotton production has shown an increase in production, a slight fall in price and a contracting demand. Wool production has receded following adverse pastoral conditions in Australia and South Africa, while jute production is expected to meet requirements.

Conclusion

In terms of food, the world's need for more food cannot as yet be said to have begun to be met. In the most heavily populated area of the world, *i.e.* South-east Asia, the food consumption is still well below the inadequate pre-war average. Some slight improvement may have occurred during the past two years, but not enough to alter the picture, and indeed in the poorest regions the position has become, if anything, even more unbalanced.

The trend towards technological improvement is shown by the production and sale and export of tractors at record levels, as well as by the rising production of fertilisers, but in general the report emphasises the necessity for increased investment in agriculture to meet the needs of the increasing world population. The report concludes by saying that much more active and positive measures will be needed before world food production begins to increase at more than its present quite inadequate rate.

H.T.

Photos: Pp. 5 and 7, Caterpillar Tractor Co.

NEW BOOKS

The Barley Crop

By Herbert Hunter, M.A., D.Sc. Pp. x + 179, illustrated. Crosby Lockwood, London, 1952. 21s.

Dr. Hunter is well known as one of the world's leading authorities on barley, and consequently a book by him on this subject is entitled to more than ordinary respect and attention.

Many years ago—in 1926 to be exact—Dr. Hunter wrote an earlier book under the title of *The Barley Crop*, intended to place on record the results of a long series of experiments carried out in Ireland, with special reference to barley varieties. In the present work Dr. Hunter has endeavoured to review and epitomise work in the crop which has taken place in subsequent years and to present a connected account of modern knowledge and experience in barley breeding. The early work referred to stimulated interest in barley breeding in countries other than Ireland and Denmark, which were the pioneers of barley work, and now widespread attention is being devoted to the matter in many countries, including England and several continental countries.

All workers in this field will accordingly welcome Dr. Hunter's book, which will be found to contain information on many points that may not be fully known. The book is divided into 11 chapters, dealing respectively with the history of barley in Britain, the botanical classification of the genus, statistics of barley yields and acreages in Britain, the origin of barley varieties, quality in malting barley, varieties, seed selection, manuring of barley and breeding objectives. The book concludes with a valuable chapter in which the previous conclusions and recommendations are summarised.

In his preface Dr. Hunter expresses the hope that the book will prove useful and satisfy requests he has received from many quarters for a revised and up-to-date account of the subject. To us it seems that the work, which is illustrated by 21 admirably reproduced illustrations and fully documented with statistics and tables throughout, is certainly well qualified to fulfil the author's hopes.

Common Farm Weeds Illustrated

Compiled by the technical and scientific staff of Plant Protection Ltd. Pp. 172, illustrated. Butterworths Scientific Publications Ltd., London, 1952. 15s.

This volume is, in effect, a weed atlas of over 80 species of the commoner weeds to be found in Britain. Each species has been photographed twice—at the seedling stage and at maturity or near-maturity—and a brief, non-technical description of its habit, botanical features and usual locality is given below the photographs.

Nowadays, with the advent of modern chemical weedkillers, it is necessary for the farmer to have a far more detailed knowledge of the weeds on his acres than hitherto if he is considering the use of these chemicals, and the first prerequisite is the confident identification of the different species one from another. The photographs in this book are on the whole clear and as natural-looking as black-and-white pictures can be, and they should afford a handy guide to those who wish to brush up and enlarge their weed identification repertoire.

The photographs are the work of Mr. and Mrs. D. L. W. Scovell, the former being a technical representative of Messrs. Plant Protection Ltd., and the book has been compiled in collaboration with the scientific staff of that firm at their Fernhurst Research Station.

Farm Machinery

By C. Culpin, M.A., Dip.Agric. (Cantab.), M.I.B.A.E. Pp. xlvi + 622, illustrated. Fourth edition, revised. Crosby Lockwood, London, 1952. 30s.

This latest edition of Mr. Culpin's now standard British textbook on farm machinery marks the seventh printing and fourth revised edition since the book was first published 14 years ago. This is a good record for any work of a technical nature, and particularly so for a subject dealing with an industry which is numerically small.

The new edition has increased in size by a hundred pages and, incidentally, in price as well. With the ever-quickening pace of farm mechanisation the enlarged edition was to be expected and the author has taken the opportunity to add a chapter on horticultural machinery, while chapters dealing with subjects in which technical progress has been rapid, such as spraying, crop drying and root harvesting, have been completely rewritten. The author is well aware of the fact that practices and ideas in farm mechanisation are liable to undergo rapid and unexpected changes and, as he mentions in the preface, has dealt with broad principles rather than with details, in order to avoid this drawback as much as possible. The complete range of machinery and implements normally to be found on British farms from the smallest holding to the largest-scale mechanised undertaking is described and discussed with liberal illustrations in each chapter. Written for farmers and students of agriculture, the book is not over-technical in the terminology used and this new and enlarged fourth edition improves the reputation of a book ideal for the needs of the working farmer.

As we mentioned, when reviewing the third edition three years ago, the clarity of exposition and the absence of obscure technicalities makes the book an admirable one for the working library of a farmer who, though he may possess no engineering training, perforce finds himself compelled to master sufficiently the intricacies of the numerous mechanical devices and the more elementary aspects of engineering problems with which he is daily confronted.

These features are well maintained in this latest edition and we can cordially recommend it.

Britain's Food Supplies

By K. G. Fenelon. Pp. 212, including statistical appendix. Methuen, London, 1952. 15s.

Food is a subject dear to the hearts of the British people and an endless topic for conversation and speculation. In this book the author, lately Director of Statistics and Intelligence at the Ministry of Food, tells the story of Britain's food supplies, with particular reference to the inter-war, war and post-war years, giving a mine of information on supplies, consumption, changing habits, controls and many other topics pertaining to the subject. He takes the broad perspective, including sections on world food supplies and international organisations; and rightly so, since we depend on the bulk of our food supplies from overseas sources.

Looking towards the future, the author is not so pessimistic as some regarding Britain's fate. A greater proportion of the national income than ever before will have to go towards buying food; that is inevitable. Any improvement in our nutritional standards will therefore depend, as we are told again and again, on increased national productivity. ' If this cannot be achieved,' says the author in his closing paragraph, ' then in the words used by Adam Smith in another connection, Britain will have to " endeavour to accommodate her future views and designs to the real mediocrity of her circumstances." '

Britain's Food Supplies could be classed as a reference book when one considers the amount of statistical information included in its pages. But it is more than that. Mr. Fenelon writes in an attractively light style and the book is, generally speaking, clear of abstruse technical terminology, rendering it quite acceptable to the majority of general readers.

Seed Testing

A Manual of Seed Testing by Amy Myers. Pp. 80, illustrated. New South Wales Department of Agriculture, 1952, 2s. 6d.

The author of this manual is the Seeds Officer of the Division of Plant Industry, New South Wales Department of Agriculture, and she has written the work to fill a gap in the Australian literature at present available on the subject of seed testing. However, although written primarily for the Australian analyst in the commercial laboratory, this manual is a well balanced and informative publication on a comparatively new technology, about which relatively little has been written. As the author says in her preface to the manual, ' Not the least of the seed analyst's efforts is the development of a technique that is standardised throughout the world, so that reports are acceptable to commerce and to science,' and on this account alone it will be well for seed analysts in other parts of the world to study the manual. Contents include chapters on apparatus, sampling, purity analysis, germination, special treatments; an appendix contains an account of new methods of testing for viability.

The Grain Sorghums

We have much pleasure in publishing the following note regarding J. D. Snowden's book on tropical sorghums at the request of Sir Edward Salisbury, Director of the Royal Botanical Gardens at Kew, Secretary and Vice-President of the Royal Society and Chairman of the Bentham-Moxon Trustees.

The importance of this extremely large group of tropical cereals as a source of food for man and beast is now widely recognised by agriculturists and others dealing with world food shortages. Over large areas of Africa and tropical Asia the grains of these plants form an important part of the diet of the natives, whilst elsewhere, especially in America and parts of Australia, they are used extensively as food for domestic animals. There are many thousands of local varieties, differing much in structure, yield and growth requirements. Their identification is difficult. It is not generally known, however, that a comprehensive survey of them was undertaken about 20 years ago, when as the result of an appeal issued in the British Commonwealth and in many other countries, several thousand flowering and fruiting heads, together with much valuable data concerning them, were received at Kew. This material was utilised in the preparation of the book entitled *The Cultivated Races of Sorghum*, by J. D. Snowden, at one time Economic Botanist in the Uganda Protectorate. In its 274 pages this book includes not only a classification and descriptive account of the 31 botanical races and of their numerous varieties and forms, but also detailed information on their distribution, culture and economics, together with an extensive bibliography of 12 pages, indices of botanical and vernacular names, and numerous illustrations. It is a work which should be in the libraries of all agricultural officers dealing with tropical field crops, and of everyone generally interested in economic botany. Copies, in paper covers, are still available from the Bentham-Moxon Trustees, Royal Botanic Gardens, Kew, Richmond, Surrey, at the price of 10s. 6d., postage extra.

' FIBRES—NATURAL AND SYNTHETIC ' —A New Journal

From the January 1953 issue **' Textile Industries and Fibres '** assumes the title of **' Fibres (Natural and Synthetic)'** with a full page size of 12 in. by 9 in.

With the December 1952 issue **' Textile Industries and Fibres'** ceased publication under its old title and style.

The change has come about as the result of a world survey of the fibre-producing and -using countries, and to maintain the Leonard Hill tradition of publishing technical journals which apply science to industry.

The new Journal will deal with the production and usage of all natural and synthetic fibres for the manufacture of textile and other fibre products. As a review of world fibres progress, greater emphasis will be given to the science and chemical treatment within the industry and it will embody reports of new materials; chemical applications; machinery; research and applicable methods of laboratory, factory and mill practice. The January issue will include:

- ' The Chemical Structure of Fibres,' by R. W. Moncrieff, B.Sc., F.R.I.C., F.T.I.
- ' The Chemist in the Wool Mill," by Dr. E. G. Carter.
- ' Orlon Dyeing with the Use of Copper Salts,' by A. J. Hall, B.Sc., F.R.I.C., F.T.I.
- ' Possibilities of Long Staple Cotton,' by C. H. Brown.
- ' Systems of Ramie Manufacture,' by S. A. G. Caldwell.

Regular features of the Journal will be included under the headings: ' International Digest,' ' Symposium,' ' News,' and ' World Market.'

Annual Reports Received

Department of Agriculture, Zanzibar Protectorate, 1950 (issued 1952). Foodstuffs were in ample supply during the year, despite a very large clove crop which not only necessitated the importance of increasing quantities of food for pickers living away from home but also reduced the number of cultivators, as nearly all the menfolk turned from their fields to the more lucrative operation of clove picking. Rice became less scarce; sugar was at no time abundant. Crop development work has included fertiliser experiments on rice, trial plantings of tobacco (not very satisfactory), cocoa establishment problems and experimental cultivation of jute substitute fibres.

* * *

The Macaulay Institute for Soil Research, 1950-51. The maintenance and improvement of soil fertility continues to be the main objective of the work of the Institute. A considerable amount of work has been done by the Pedology Department on the Scottish soil survey. Advances have been made in the Spectrochemistry Department. Flame photometry, for instance, has been introduced for the determination of potassium, sodium and calcium.

* * *

South Pacific Commission, 1951 (issued 1952). The SPC is an advisory and consultative body set up by the six Governments responsible for the administration of island territories in the South Pacific region. Its purpose is to recommend to the member Governments means for promoting the well-being of the peoples of these territories.

£2,900 were paid to the Fiji Government to assist in the development of the Naduruloulou Introduction Garden. The commission engaged Mr. D. H. Urquhart, a noted authority on cacao, to undertake a survey of South Pacific territories.

* * *

Indian Tea Association, Scientific Department, 1951 (Tocklai Experimental Station). Much work has been done on this report and we give here only a few extracts. Correlations have been obtained between dosage, as top dressing, of certain minor nutrient elements and the growth of young tea plants. These elements may become of importance for vegetative propagation and replanting old tea areas. It is suggested that the presence of particular forms of organic nitrogen are of importance in the metabolism of the tea plant and its associated fungus. It has been proved that a tree canopy provides a primary physiological requirement of an optimum light intensity.

CONGRATULATIONS TO SIR JOHN RUSSELL

WE offer to Sir John Russell, F.R.S., our respectful felicitations on having attained on October 31 last his eightieth birthday. On that occasion there were assembled at dinner in the Apothecaries Hall, at the invitation of Mr. T. Ainslie Robertson, chairman of Plant Protection Ltd., a distinguished company, including leading representatives of science, agriculture, commerce and the political, diplomatic and administrative corps, to celebrate this event and to do Sir John honour.

It is indeed remarkable that after such a long and very active life, in which he has contributed so greatly to science in application to agriculture, Sir John still maintains so many and diverse activities. After retiring nine years ago from the direction of Rothamsted Experimental Station, which he did so much to rescue from the slough of despond into which it had unfortunately fallen and raise it to the shining pinnacle of eminence which it occupies at present, he was able three years ago to preside over the British Association with great distinction and deliver a memorable presidential address. In 1951 he delivered an almost equally noteworthy address at the Fernhurst Conference. In between these two events he undertook a strenuous and prolonged tour in East Africa which was subsequently extended to India.

Sir John and Lady Russell in the garden of their Oxfordshire home

Photo: The Field

One can only marvel at his boundless energy as much as one admires his learning and his gift of imparting information in terms which are so phrased that they make the abstruse seem simple and the obscure crystal clear.

To this journal he has always been a firm friend and in our early days we have been much heartened by his sage advice and kindly encouragement. We would wish to add our own small tribute of congratulation and good wishes to the general chorus which manifested itself on the occasion and which found expression in the eloquent speeches of Mr. Walter Elliott, M.P., and Professor E. D. Adrian, O.M., President of the Royal Society, in proposing Sir John's health, and the tributes paid by Lord Radnor and others. In his reply Sir John gave some intriguing details of his early life and described how, despite the advice of his seniors, he forsook the paths of pure chemistry to wander along the then largely uncharted ways of agricultural science. In those wanderings he has touched many aspects and, let us add, he has touched nothing which he did not adorn.

Blackpool Royal Show Preparations

Four-in-hand coaching teams—once a familiar sight on the roads of Britain when they were the chief means of transport—will be seen at the 1953 Royal Show.

The provisional applications for machinery shedding and space are well up to expectation. Applications for ordinary shedding, machinery-in-motion, and open ground space considerably exceed the area allotted at last year's Royal Show. The Blackpool showground will be comparable in size and layout to the Show at Cambridge in 1951, and space for exhibits should be fully booked when entries close at the end of the year.

Several innovations and improvements are contemplated. Exhibitors will be grouped, where desired, into centres of interest and arrangements are being made for the resumption of the Poultry Section.

Commonwealth Food Production Plans

During the talks which took place at the Commonwealth Economic Conference, held in London in early December, increased production of food was one of the principal subjects for discussion.

An increase in agricultural production of 20% by 1957 is aimed at by Australia (1947-52 average being taken as 100%). By irrigation and development of existing agricultural land it is planned to increase the wheat acreage by one-third to 13,500,000. Sugar production, too, is to be encouraged and the export surplus is expected to increase from 168,000 tons (1951) to 715,000 tons in 1957-58.

By 1954 New Zealand plans to have increased her exports of lamb by 20,000 tons, butter by 8,000 tons and cheese by 5,000 tons annually.

Experiments in Cotton Pest Control

Satisfactory results in the control of cotton jassid (*Empoasca libyca*) and cotton flea beetle (*Podagrica puncticolles*) have been reported from the Sudan, as a result of experimental work by the Entomological Section of the Ministry of Agriculture's Research Division, using a Micron sprayer.

The Government Entomologist reports that the application of DDT at an estimated rate of 1 lb. per acre in a concentrated oil emulsion gave satisfactory control of the cotton jassid. A swathe width of 235 ft. was obtained, giving an application rate of 1-1½ acres per minute with a tractor speed of 2-3 m.p.h.

In phyto-toxicity trials against cotton flea beetle, using the Micron, over 20 lb. of DDT per acre or a 25% emulsion were applied with no harmful effects on the cotton.

FARM MACHINERY

The Hawaiian Sugar Planters' Association cane cutter, pick-up and windrower

New Sugar Cane Harvester from Hawaii

In WORLD CROPS two years ago (**3**, No. 2, p. 78, February 1951) there appeared an article describing four new types of sugar cane harvester which had recently appeared in Australia. Now it is reported that the Hawaiian Sugar Planters' Association has recently announced the successful development of a new sugar cane harvester which cuts, picks up and windrows the cane. First designs for this new machine were produced in 1946.

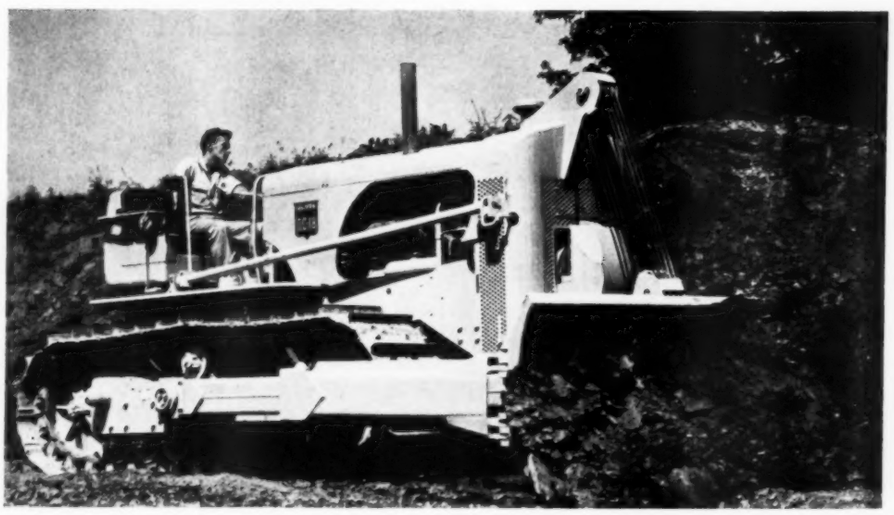
A long-felt need in parts of the Hawaiian Islands has been a machine which will harvest and remove cane from rain-soaked fields, with the least possible damage to the canes themselves and to the canefields. Particularly was this wanted in the very wet plantations of the Hilo coast of the island of Hawaii.

For over two years successive designs for the machine were produced and rejected. At length a promising design for a cane cutter was evolved which enabled the cane to be cut and laid in ordinary windrows from which it could be readily loaded on to lorries by cane grabs. Ultimately, a further improved model was devised, which has recently come into use. This is shown in the photograph; as can be seen, the equipment for cutting, picking up and windrowing the cane is sidemounted behind a powerful tractor.

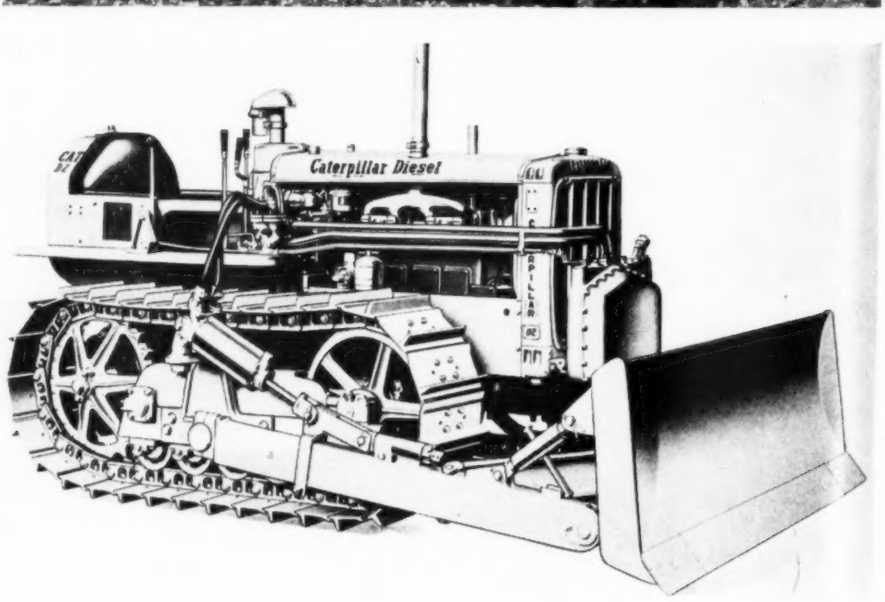
The cutter takes the form of a circular, saw-toothed revolving knife mounted at the front edge of the pick-up unit, which is fitted with revolving chains provided with teeth which carry the cane to a platform behind the machine, whence the cut cane is windrowed out to the side of the path of the machine as it traverses the canefield along the rows.

An outstanding feature is that this machine leaves the cane stools in good condition for ratooning and does the minimum damage to the cane; in this regard it gives almost as good results as harvesting by hand.

The machine can hardly be said to have completely emerged from the experimental stage and before it becomes fully commercialised further improvements will almost certainly be introduced.



(*Below*). **The 'OC-18' crawler tractor, now available from the Oliver Corporation. Rated horse power is 126 and a range of equipment is available for the new tractor**



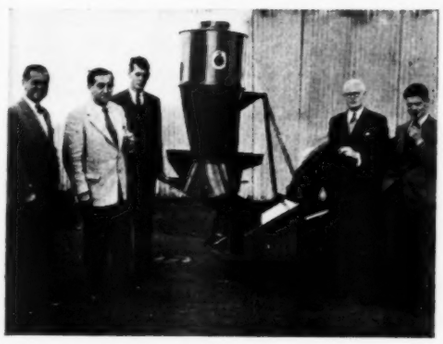
A new toolbar bulldozer blade attached to a Caterpillar D.2 tractor and operated hydraulically by the lever beside the seat. Width of the blade is 6 ft. 8 in.

126 h.p. Oliver Crawler

The Oliver Corporation has announced that its new 'OC-18' crawler tractor is now available. Air steering is standard equipment on this tractor. An over-centre clutch runs across the whole width of the dashboard so the operator can easily find it without taking his eyes off the job. Other features include pushbutton electric starting with a cold weather starting aid as standard equipment, centre positioned gear shift lever, parking brakes and throttle located at right arm rest.

Oliver states that the tracks have been designed for maximum ground contact.

New David Brown-ScotMec Hammer Mill



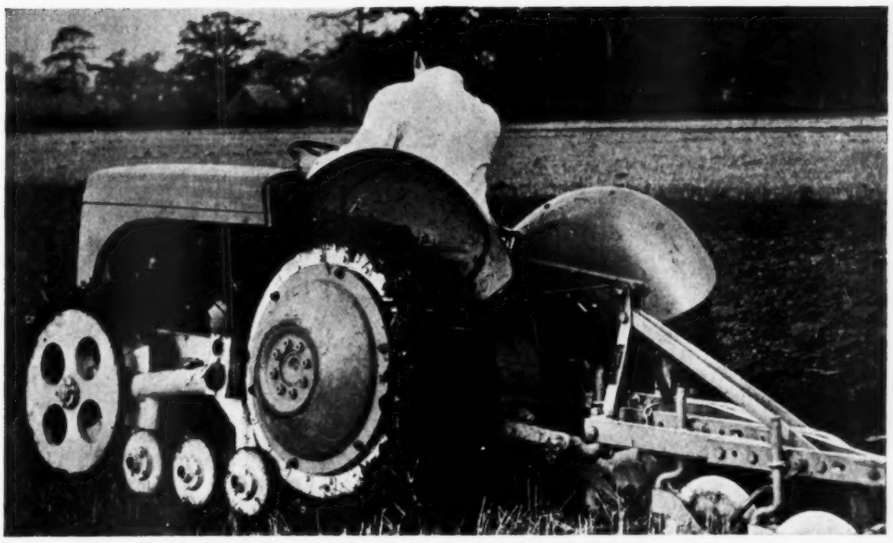
Agreeing on the distribution of the 'David Brown-ScotMec' mill are Mr. P. Sandor, Dr. B. T. Sandor and Mr. I. S. Horabin of ScotMec with Mr. P. Smith and Mr. L. Kenyon of David Brown Tractors Ltd.

Scottish Mechanical Light Industries Ltd. have announced that a new 'David Brown-ScotMec' Hammer Mill, with support frame specifically designed for the David Brown 'Cropmaster' tractor, is now being made in co-operation with David Brown Tractors Ltd., and is the only HammerMill distributed through the David Brown dealer organisation.

Features of the new mill, which are reported to have drawn particular attention during practical tests, were: the ability of one man to fit the mill ready for operation within four minutes; rigidity of the mill when run over uneven ground without straining the hydraulic lift; output of ground oats of 35 cwt. per hour for cattle feed and 15 cwt. for pig feed maintained without overloading the tractor.

A range of 12 screens is available from as fine as 0.0235 in. perforation (grinding for human consumption) to the largest with $1\frac{3}{8}$ in. holes, so that any grain or roughage may be ground to any fineness.

The 'David Brown-ScotMec' Hammer-Mill is priced at £130, including stabilisers.



The Tracpak lubricated track conversion on a Ferguson tractor

Wheel/Tracklayer Tractor Conversion

A full crawler track conversion set with lubricated trackpins is now available for the Ferguson tractor. Named the 'Tracpak,' it has been perfected after over two years' research and development by Messrs. George Bryden Engineering Ltd., Seacroft, Leeds. A prototype was submitted to the National Institute of Agricultural Engineering in 1951, since when proved production sets are coming off the line. The Bryden Company have formed a subsidiary, Tracpak Ltd. of Seacroft, Leeds, and Boughton, Northants, for production and sales.

Full lubrication of the track has been achieved by setting each one of the 37 case-hardened steel pins in its own oil bath containing a third of a pint of oil. The track plates are 10 in. wide, each with an integral grouser 2 in. deep. The complete track laying assembly, which costs £350 in the U.K., consists of a pair of track units, two driving rings, two side frames and a cross beam passing under the tractor seat and joining the two track frames together. When the conversion which is reported to take only an hour has been made the body of the tractor is mounted on the assembly at the front axle pivot and at swivel brackets attached to each side of the cross beam at the rear. Each of these three points of suspension carries resilient bush connections which, together with the inclined coil spring and the elevation of the driving sprockets considerably minimise any shocks to the tractor body.

Counterbalanced bulldozer

Designed by the same firm is a counterbalanced bulldozer for use with the Bryden Tracpak converted Ferguson. This has an independent counterweight system of lift, the existing tractor hydraulic system being used solely for lowering, holding, 'pressure on work' and working cycle generally.

The bulldozer is of unit construction with three-point hinge mountings. The price on the home market is £160.

Pilot sets have been shipped to 15 countries overseas, including Canada, India, Ceylon, British West Indies, Belgian Congo and the Continent. The export department of Messrs. Tracpak Ltd. is at Messrs. L. E. Vincent and Partners Ltd., of 7 Chesterfield Gardens, London, W.1, who will welcome all overseas enquiries and visitors at any time.

Dron-Wal Knapsack Sprayer

Last month, in describing the 'Dronwal' knapsack sprayer (p. 431), we gave the gross weight of the sprayer as being 256 lb. We much regret that this was incorrect and are informed by the makers, The Philip B. Waldron Co., that the gross weight of this machine is, in fact, 50 lb.

Fordson Demonstrations in Holland

Reports of the first of a series of ten large-scale demonstrations of the new Fordson Major have been received from the Ford Company in Holland. Staged near Rotterdam by Ford, Amsterdam, in conjunction with their two local main dealers, the demonstration was attended by some 1,200

farmers, Dutch Government officials and Ford representatives from Belgium and the U.K. Twenty-one tractors and the same number of implements were demonstrated on 20 acres of medium-heavy Dutch farmland, with its characteristic flat terrain.

Highlight of the demonstration was the performance of two tractor men from Ford Motor Co. Ltd., Dagenham, who, in 15 minutes, stripped and rebuilt the new Fordson Major's three engines.

Commercial Collaboration

From December 6, 1952, Messrs. Drake & Fletcher Ltd. and Messrs. Kent Engineering & Foundry Ltd., of Maidstone, have arranged for a considerable measure of cooperation between the two companies. This takes the form of standardisation of production and cooperation in design and will result in an immediate increase in the range of machines that both companies offer, an improvement in the service available and, taking the long-term view, a substantial reduction in costs.

Yugoslavia Mechanises

One hundred David Brown Cropmaster diesel tractors and ploughs, with corresponding spares, have recently been shipped to Yugoslavia by David Brown Tractors Ltd., of Meltham, Yorkshire.

Largest consignment of agricultural machinery ever sold to that country by a British manufacturer, the equipment will be distributed to cooperative farmers in various parts of Serbia and the Vojvodina.

The order was placed in England by Srbokoop Export-Import, of Belgrade. Negotiations were opened six months ago during a visit to Yugoslavia by David Brown European representative, Mr. P. F. Eisler, by whom arrangements were made for the subsequent visit of the firm's chief overseas demonstrator, Mr. J. Wale, with two machines and implements.

Tractors for New Zealand, Spain and Germany

The 10,000th Ferguson tractor to be exported to New Zealand and the 1,000th Ferguson tractor to be exported to Spain recently left the Standard Motor Company's factory at Coventry. By the end of 1952 another country — Germany — also had received a total of 1,000 Ferguson tractors.

In 1937 the U.K. produced about 18,000 tractors, of which only a small proportion were exported. In 1950, with a production of over 120,000, the U.K. was, after the United States, the second largest producer of agricultural tractors in the world; and she exported only 6,000 fewer than the United States.

New Zealand, which in 1951 had about 34,000 tractors (one tractor to every 72 acres of arable land), is already one of the most highly mechanised countries in the world so far as agriculture is concerned. Moreover, New Zealand leads the world in farm productivity.

Import regulations put a severe restriction on the number of tractors that the U.K. can export to Spain. The total of all Ferguson tractors in Spain is just over 1,000.

Tractor school at San Andre, now in its second year of operation. This is part of a little-known programme of international cooperation that has existed for the last ten years between the U.S.A. and El Salvador

Trade Publications Received

Shell Agricultural Leaflets. These now number 42, covering the complete range of agricultural chemicals marketed by Shell Chemicals Ltd. The leaflets have recently been revised and reprinted, and give details of application methods and rates, precautions to be taken and general information about the various products.

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'Pneumatic Grain Conveyors and Storage Equipment.' Compiled as a guide to prospective purchasers, this booklet describes the King cyclonic pneumatic grain conveyor and storage plants manufactured by Geo. W. King Ltd. The King suction and blowing plant and also the King diesel heater and conveyor plant are among the new items included in the illustrations.

'Producers of Wealth' is the title of a new booklet published by the Caterpillar Tractor Co. of Peoria, Illinois, dealing with the company's growth during the 20-year period, 1930-50. Many readers probably do not realise that the first 'Caterpillar' diesel track-type tractor came off the line in 1931, just over 20 years ago, and this booklet gives an interesting picture of how this vast organisation has grown up in such a comparatively short time.

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A number of new catalogues have been issued by the International Harvester Export Company giving latest information on some of the many farm implements and tractors manufactured by the Company. These recent publications give details of the **W4 Standard Tractor, Mouldboard Ploughs, Cultivators** (for Farmall Cub, Super A and Super C tractors), **Universal Sugar Cane Tools, High Clearance Farmall Tractors** and **Cane Tools and Forward Mounted Corn Planters** (for Farmall tractors). A new catalogue in Spanish (**Arados Para Tractor**) features 15 McCormick International disk, harrow and mouldboard ploughs.

The story of how two agencies have cleared land in, respectively, Brazil and Chile from brush or jungle to usable, fertile fields is told in a further IH publication, **'Land Clearing—A Chapter in the Story of Man's Progress.'**

WORLD CROP REPORTS

SOUTHERN RHODESIA

Cheerful tea prospects. In a few years' time Southern Rhodesia should be producing enough tea to satisfy the total requirements of the country. The latest statistics show that the average annual tea consumption, over the five-year period from 1945 to 1949, was just over 1,200,000 lb., or about two-thirds of a lb. per head of Southern Rhodesia's total population. The production of tea in the country at the end of that period was about 660,000 lb. per year. The crop for 1952 has been estimated at 1,000,000 lb., and in a few years it is estimated that production will reach the 1,500,000 lb. mark. At present there are just over 1,500 acres under tea in Southern Rhodesia, and there are plans to plant a further 500 acres. When the total of 2,000 acres is in full bearing, an annual crop of 2,000,000 lb. is expected.

Tobacco growers encouraged. Urging tobacco growers to do everything in their power to produce a crop of not less than 125,000,000 lb. in the coming season, Mr. R. B. Harland, president of the Rhodesia Tobacco Association, said in a broadcast from Salisbury recently: ' If we fail, we shall be the chief losers and we may well have to look on and watch other producing countries edging in on something we ourselves should have. With a concerted effort by every producer, this need not happen.' There were two main reasons for wishing to increase yields this year, Mr. Harland said. It was necessary for the Rhodesian tobacco industry to honour its obligations under existing agreements with British and Australian manufacturers. Secondly, it was made necessary by the narrowing margin between costs of production and gross return.

Mr. Harland said countries were looking more and more for supplies of sterling—as opposed to dollar—tobacco and to Southern Rhodesia in particular for the best types of flue-cured tobacco. Southern Rhodesia could definitely supply their requirements and, if the last season had not been so climatically disastrous in so many areas in the country, the target figure of 125,000,000 lb. would have been achieved by now.

He said the main reason for the short crops of the past two years was undoubtedly seasonal and the signatories to the London and Australian agreements were very fair in appreciating this. ' Nevertheless,' he added, ' we would be breaking our side of the bargain if we did not do everything in our power to build up our crop immediately to get at least 125,000,000 lb.'

Mr. Harland was introducing the new series of broadcast discussions which aim at showing how the countrywide average yield per acre can be raised to not less than 700 lb. Over the past six seasons the average has varied between 500 lb. and 683 lb., although many individual growers have consistently averaged more than 900 lb. per acre. The aim of this series of broadcasts is to discover the main reasons why Southern Rhodesia's yields are lower than those of the other principal tobacco-growing countries.

ADEN

Cotton estimate. The 1952-53 production of cotton in the Aden Colony and Protectorates is currently estimated at 6,250 bales (500 lb. gross) compared with 6,025 bales in 1951-52. The current acreage for harvest is estimated at 7,500 acres, a decrease of 2,430 acres from the preceding season. Cotton included in the above figures is extra long staple (Sakellarides variety), but small additional quantities of short-staple cotton are also grown in some areas for native hand-spinning purposes. Experimental work is being conducted this season in three additional areas in an effort to increase yields per acre.

PHILIPPINES

Promising rice harvest. The 1952-53 rice harvest of the Philippines is placed at 6,150 million lb. of rough rice in an early forecast. This estimate is considerably larger than the previous record of 5,700 million lb. harvested two years ago. The area planted in rice is estimated at 6,000,000 acres compared with around 5,500,000 acres in the last two seasons.

Growing conditions have been favourable in most producing regions, especially in the main rice area of central Luzon. The upland harvest, which is a small proportion of the total crop, was in full swing in the islands during October, and the lowland harvest had commenced in some places.

Since the main crop is not harvested until December, the final output depends on whether reverses from bad weather, such as from tropical storms, do not occur before the harvesting is ended. Should crop losses from these hazards be avoided, and the prospective crop is fully harvested, production should be ample to meet the domestic requirements of 1953.

ENGLAND AND WALES

Small fruit and vegetables—annual returns. The total acreage under small fruit continued to decline, the area in 1952 being 2,800 acres (6%) less than last year. The acreage of strawberries declined by 1,500 acres (9%).

The total area returned under the composite heading ' vegetables (excluding potatoes), crops under glass and flowers ' remained practically the same as last year, although substantial increases and decreases occurred among the individual crops. The largest area increases were in brussels sprouts (4,600 acres, 11½%), carrots (3,100 acres, 13%), peas, green for canning or quick freezing (3,300 acres, 14%) and peas to be harvested dry (3,800 acres, 3%). The area remaining under spring cabbage (planted in the previous year) declined by 4,600 acres (34%), due to the earlier season, while summer, autumn and winter cabbage and cauliflower also showed decreases. The acreage of lettuce declined by 1,700 acres, or over 20%.

September 1952 agricultural returns. The Ministry of Agriculture reports that, compared with a year ago, livestock numbers show a small reduction in total cattle and substantial increases in total sheep and pigs. A further decline occurred in total workers, the decrease being mainly in regular male workers. There was a small increase in the area under vegetables.

In more detail, the combined area of vegetables separately returned shows a net increase on the year of 3,000 acres (2%). The area under green vegetables declined by 1,700 acres (1%) and that under other crops increased by 4,700 acres (10%).

The total labour force returned is down on the year by 12,000 (2%), the only increase being in casually employed women and girls (10,400 or 11%). Regular male workers were fewer by 19,000 (4%), casual male workers by 2,100 (2%) and regular female workers by 1,300 (2%).

ISRAEL

A promising year. Comparison of the crop of the Jewish year 5712 (1951-52) with that of 5711 (1950-51) reflects improvements in almost every branch of agriculture. The yield of wheat and rye was 37,000 tons compared with 13,600 tons last year; barley, maize and other feeding stuffs 136,000 tons, compared with 33,700 tons; legumes 10,000 tons (1,000 tons in 5711); fodder 115,000 tons (55,000); various oilseeds 10,000 tons (7,500); tobacco 3,000 tons (1,600); vegetables 255,000 tons (145,000); potatoes 53,000 tons (36,000); sugar beet 10,000 tons (in

the previous year sugar beet was not cultivated); flax 5,000 tons (1,000); table grapes 10,000 tons (7,100); deciduous fruit 15,000 tons (9,250); olives 12,000 tons (2,700).

Urban markets were far better supplied with vegetables this year both as a result of the increased area cultivated and the rapid development of smallholdings.

Taking into account adverse climatic conditions, the experience of the past year is not discouraging, and it has been proved that beet can be cultivated both with and without irrigation in practically all regions of Israel.

In the course of the past year a further 20,000 dunams were planted with vines and fruit trees, and preparations are being made for the planting of a similar area in 1952-53.

SOUTH AFRICA

Natal sugar cane crop. Our South African correspondent reports that Natal sugar-cane growers have exceeded all expectations and the latest estimate of the current cane crop is between 620,000 and 630,000 tons. The crop is 20,000 tons in excess of the Union's estimated requirements and this year is the first in which the newly developed cane, N.C.O.310, has been in full production. It is expected that, given ordinary weather conditions, the 1953 crop will be about 700,000 tons, especially as it will now be possible to let the cane stand until June before cutting, owing to the carry-over that will be available. It is estimated that the early cutting necessitated last year by the scarcity cost the industry about 20,000 tons of sugar through the use of immature cane.

JAPAN

Rice harvest forecast. The official forecast (September 15) of Japan's 1952 rice harvest is 26,300 million lb. of rough rice (9,583,000 metric tons of brown rice), compared with 24,800 million lb. (9,042,000 tons) in the preceding year. Although 1952 production exceeds considerably last year's poor harvest, it is less than the largest post-war output of 1950. Larger crops were produced also in the pre-war years.

Better-than-average per acre yields are attributed primarily to favourable weather conditions. The growth of both irrigated and upland rice improved in some sections of Japan in August and continued good in early September. Rice harvesting begins in August and continues well into November in the warmer areas of Japan.

MALAYA

Rice production. According to the Rice Supplement of the Monthly Statistical Bulletin of the Federation of Malaya, the production of milled rice in respect of the season 1951-52 was 341,000 tons, a decrease on the previous year of 44,000 tons, and of 100,000 tons on the record season of 1949-50. The decrease is attributed to a decline in the area planted, and to a reduced yield per acre, although no reason for this decline in yield is suggested.

WORLD CROPS

OUR NEXT ISSUE will include an article by A. E. Haarer entitled **Congo Jute and its Potentialities;** Dr. R. O. Whyte writes on **Legumes in Tropical Agriculture;** Eric Hardy, F.Z.S., writes on **The Cultivation of Arid Zones.**

Continuing his account of **Pest Control Ltd.'s** contribution to agricultural research, Dr. W. E. Ripper describes the overseas activities of his firm. This will be the fourteenth article in the series, **Industry's Contribution to Agricultural Research.**

Other articles and the usual regular features will also appear in the February issue.

The average yield per acre of 'wet' or irrigated rice is stated to be 975 lb., and of non-irrigated or 'dry' rice 542 lb. These figures are estimated on the harvested area and not on the total planted area. For the 'dry' area this is of little moment, for the area is small and the total loss of crop negligible. But 31,630 acres, or 3.8%, of the 'wet' area failed to reach maturity—mainly through pests and diseases. It is difficult to understand why the totally destroyed crop area was not taken into account in estimating the average yield, for this 31,630 acres absorbed capital, labour and seed, the loss of crop being due to the same hazards of cultivation as in areas where the loss was less severe, enabling some crop to be reaped.

Estimating the average yields on the total planted area gives 932 lb. per acre of milled rice for 'wet' rice, and 540 lb. per acre under the dry method of cultivation.

The total area planted with rice in Malaya is now about 800,000 acres annually, the crop supplying almost half the domestic requirements of the country. But, whereas before the war the net imports of rice were around 500,000 tons annually, imports are now less despite increased population, necessitating a continuation of rationing of supplies to consumers.

The area annually planted is now about 100,000 acres greater than in pre-war years, while the average yield per acre is about the same. It is probable that any material increase in the local production of rice depends largely on the ability of the Malayan Department of Agriculture to render the cultivation of rice more economically attractive by increasing the yield per acre by such means as improved seed, manuring, or by reducing the cost of cultivation.

D.H.G.

WORLD

Cotton supplies 1952-53. The world supply of cotton for 1952-53 is tentatively forecast at 48.7 million bales, or 1.9 million bales higher than that of a year ago, according to preliminary reports from most of the major cotton-producing countries. An increase of 3.0 million bales in world stocks between August 1, 1951, and August 1, 1952, is expected to be partly offset by a decrease of approximately 1.1 million bales in world production. World consumption in 1951-52, estimated at 32.2 million bales, is about 0.8 million below last year's estimate.

In calculating the Free World supply for 1952-53 separately from that in the Communist countries it appears that the supply is about 1.9 million bales larger than that of a year ago, while the supply (stocks and production) in the Communist countries appears to be about the same as a year ago. However, these countries have been importing increasing quantities in 1952 from other parts of the world, particularly Egypt and Pakistan, to supplement an apparent decline in production in China and to meet reported increases in mill demand.

World cotton production in 1952-53 is estimated tentatively at 34.2 million bales, or 1.1 million less than a revised estimate of 35.3 million for 1951-52. The estimates for Northern Hemisphere countries are early or mid-season estimates, while those for Southern Hemisphere countries are necessarily for crops now being planted for harvest early in 1953.

Production in the United States is down by 731,000 bales (based on October estimates) from that of a year ago. Preliminary reports indicate decreases of nearly 300,000 bales in Mexico, 200,000 in India, and 200,000 in China. Reductions of about 150,000 bales are expected for Brazil, Argentina, and Paraguay since yields per acre were abnormally high last year and planting (late in 1951) of the 1951-52 crop was done when world cotton prices were much higher than at the present time.

Increases of nearly 200,000 bales are reported in Egypt (estimated unofficially), about 100,000 in Turkey, and 100,000 in Pakistan.